



United States
Department of
Agriculture

Agricultural
Research
Service

Technical
Bulletin 1805

A Revision of the Subfamily Criocerinae (Chrysomelidae) of North America North of Mexico

USDA
NAT'L AGRIC LIBRARY

1953 AUG -0 -

GOVERNMENT SERIALS

United States
Department of
Agriculture

Agricultural
Research
Service

Technical
Bulletin 1805

May 1993

A Revision of the Subfamily Criocerinae (Chrysomelidae) of North America North of Mexico

Document Delivery Service
Entomological Laboratory
National Museum
1011 Jefferson Drive
Boulder, Colorado 80501

Richard E. White

Systematic Entomology Laboratory, Plant Sciences Institute
Agricultural Research Service, USDA
c/o U.S. National Museum of Natural History
Washington, DC 20560

Abstract

White, Richard E. 1993. A Revision of the Subfamily Criocerinae (Chrysomelidae) of North America North of Mexico. U.S. Department of Agriculture, Technical Bulletin No. 1805, 158 pp., 32 plates.

This revision recognizes 44 species of Criocerinae in America north of Mexico. For each species there is a description, drawings, and a map showing the range. There are scanning electron micrographs showing some of the most significant morphological features of selected species.

Twelve species are described as new: *Lema maderensis*, *L. melanofrons*, *Neolema adunata*, *N. cordata*, *N. ovalis*, *N. quadriguttata*, *Oulema coalescens*, *O. elongata*, *O. laticollis*, *O. melanoventris*, *O. minuta*, and *O. variabilis*. New synonymy includes the following: *Lema albi* Lacordaire [= *N. sexpunctata* (Olivier)], *L. balteata equestris* Lacordaire [= *L. balteata* LeConte], *L. trilinea daturaphila* Kogan and Goeden [= *L. trilinea* White], *Oulema gaspensis* Brown [= *O. palustris* (Blatchley)], *O. palustris floridana* Schaeffer [= *O. palustris* (Blatchley)], and *O. coloradensis* Linell [= *O. texana* (Crotch)]. *Lema circumvittata* Clark had been ranked as a subspecies of *L. conjuncta* Lacordaire; it is here raised to the species level. *Lema trabeata* Lacordaire is also raised to the species level; it has to the present been listed as a subspecies of *L. confusa* Chev. New combinations include *Neolema ephippium* (Lacordaire), *N. gundlachiana* (Suffrian), *N. jacobina* (Linell), *N. sexpunctata* (Olivier), *Oulema concolor* (LeConte), *O. cornuta* (Fabricius), *O. maculicollis* (Lacordaire), *O. margineimpressa* (Schaeffer), *O. sayi* (Crotch), *O. simulans* (Schaeffer), and *O. texana* (Crotch). In addition, *N. gundlachiana* (Suffrian) is newly recorded from the United States. Neotypes are designated for five species: *Lema trivittata* Say, *L. trilineata* (Olivier), *Oulema collaris*, (Say), *Oulema cornuta* (Fabricius), and *Liliocerus lili* (Scopoli). *Lema ornata* Gravenhorst is treated as a forgotten name, for it has remained unused in the literature as a senior synonym for over 50 years. It is probable that it equals *Lema trilinea* White. One name is treated as of uncertain status: *L. intermedia* Guérin.

Keywords: Chrysomelidae, Coleoptera, Criocerinae, *Criocerus*, *Lema*, *Liliocerus*, *Neolema*, *Oulema*, taxonomic revision.

While supplies last, single copies of this publication may be obtained, at no cost, on request from USDA-ARS-BA, Systematic Entomology Laboratory, Bldg. 046, Beltsville Agricultural Research Center-West, Beltsville, MD 20705.

Copies of this publication may also be obtained from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161.

Trade names are used in this publication solely for the purpose of providing specific information. Mention of a trade name does not constitute a guarantee or warranty of the product by the U.S. Department of Agriculture or an endorsement by the Department over other products not mentioned.

May 1993

Acknowledgments

My thanks are extended to the following individuals, who have loaned specimens for this study or aided in other ways. R.C. Bechtel, Division of Plant Industry, Reno, Nevada; Nicole Berti, Muséum National d'Histoire Naturelle, Paris; Susann Braden and Walter Brown, National Museum of Natural History, Washington, DC.; H.R. Burke, Department of Entomology, Texas A&M University; N.M. Downie, Lafayette, Indiana; W.R. Enns, University of Missouri; Bryan Farrell, University of Maryland; D.H. Kavanaugh, California Academy of Sciences; Laurent LeSage, Biosystematics Research Center, Ottawa, Canada; A.F. Newton, Museum of Comparative Zoology, Harvard University; Diether Peschken, Agriculture Canada, Regina, Saskatchewan; E.G. Riley, Department of Entomology, Texas A&M University; E.P. Rouse, University of Arkansas; Sharon Shute, British Museum of Natural History; J.M. Sullivan, St. Louis, Missouri; C.A. Triplehorn, The Ohio State University; Ken Walker, Museum of Victoria, Australia; Robert Ward, Washington, DC.; R.E. Woodruff, Florida Department of Agriculture, Gainesville.

My appreciation is expressed to Allen Norrbom, Edward Balsbaugh, Jr., and Ingolf Askevold for reviewing the manuscript.

Contents

Introduction	1
Historical review	2
Materials	2
Methods	3
Nomenclature	5
Quoted data	6
Hosts	6
Life history summaries	8
Species life history data	9
Diagnostic characters	12
Abbreviations	14
Criocerinae	14
List of Criocerinae of North America	18
Key to North American genera of Criocerinae	19
<i>Lema</i> Fabricius	19
<i>Neolema</i> Monros, new status	56
<i>Oulema</i> Des Gozis	78
<i>Crioceris</i> Müller	121
<i>Lilioceris</i> Reitter	128
A forgotten name	132
Uncertain status	133
References cited	134
Illustrations	
Maps	
Male genitalia	

A Revision of the Subfamily Criocerinae (Chrysomelidae) of North America North of Mexico

by Richard E. White

Introduction

The subfamily Criocerinae is a large and nearly worldwide group of roughly 1,500 described species. The North American species are medium-sized leaf beetles (2.7-8.0 mm long) that feed on no less than seven different families of plants. Although some species are serious economic pests, this subfamily has never been thoroughly studied. Recent elevations of supposed subspecies to the species level (Balsbaugh and Hays 1972, White and Day 1979) provide evidence of our incomplete knowledge of the interrelationships of the taxa. The transfer by Monros (1960:229) of certain species traditionally placed in *Lema* to *Oulema* has been corroborated but found to be incomplete, for herein more species are similarly transferred.

This study is intended to consolidate existing information on the North American species of the subfamily; describe new taxa; provide a description for each species; correct generic assignments where necessary; establish new synonymy as needed; redefine known species; and provide keys, illustrations, and maps to aid in identifications. Twelve species are herein described as new, and 5 new synonyms and 11 new combinations are presented. One species is newly recorded from the United States. Two former subspecies are raised to the species level. This work brings to 44 the number of North American species.

Illustrations of each species (figs. 1-45) are intended to show the extremes of variability in color pattern and (if it occurs) in melanism.

The literature for many species is extensive, so to aid in its examination, an indication is given of the type of information provided by each reference cited in the species synonymy (e.g., "Monros, 1960:222 (world checklist), Kaufmann, 1967:363 (biology and larva)"). Biological notes on specimen labels and those found in the literature are summarized in the "Hosts" section of each species treatment.

Four economically important species have been accidentally introduced into North America from Europe: *Lilioceris lili* Scopoli, the lily leaf beetle (about 1944), *Crioceris asparagi* (Linnaeus), the asparagus beetle (about 1859), *C. duodecimpunctata* (Linnaeus), the spotted asparagus beetle (about 1881), and *Oulema melanopus* (Linnaeus), the cereal leaf beetle (about 1959). The most injurious native species is *Lema trilinea* White, the threelined potato beetle; it is not as injurious as it once was, and not as significant as the last three species named above. One European species, *Lema puncticollis* (Curtis), has recently been introduced into Canada in hopes that it will help in the control of Canada thistle. There is as yet no proof that it has become established.

The species currently of the greatest importance to agriculture is the cereal leaf beetle, *Oulema melanopus* (L.). Its significance and the interest in it are shown by the more than 400 papers published in economic literature of North America since the early 1960's (Battenfield et al. 1982).

Historical Review

Three of the species included herein were described by Linnaeus (1758:376) as members of the genus *Chrysomela*: *Crioceris asparagi*, *C. duodecimpunctata*, and *Oulema melanopus*. In 1763 Scopoli described *Attelabus lili*, a species now in the genus *Lilioceris*. Fabricius described two North American species: *Lema solani* (1798) and *Lema cornuta* (1801, now *Oulema*). Two species were described in *Crioceris* by Olivier in 1808: *Lema sexpunctata* (here placed in *Neolema*) and *L. trilineata* (now *trilinea* White). Say in 1824 described two species in *Lema*: *L. trivittata* and *Oulema collaris*. Guérin-Méneville in 1829 (1844) described the single species *Crioceris nigrovittata* (now in *Lema*). Curtis in 1830 described *Crioceris puncticollis* (now in *Lema*). In 1835 Chevrolat described the species *Lema confusa*.

The number of taxa increased significantly in 1845 when Lacordaire described *Lema albini* (here placed in *Neolema*), *L. balteata equestris*, *L. conjuncta*, *L. ephippium* (here placed in *Neolema*), *L. confusa trabeata*, *L. trivirgata*, *L. brunnicollis* (now in *Oulema*), and *L. maculicollis* (here placed in *Oulema*). Clark (1866) added *Lema circumvittata* and *L. pubipes*. Crotch (1873a) described *Lema texana* and *L. sayi*; both are now in *Oulema*. Gemminger and Harold (1874) provided the replacement name *Lema opulenta* for the junior homonym *L. ornata* Baly. Suffrian (1874) proposed *Lema gundlachiana* as a replacement for *L. intermedia*. LeConte (1884) added two species: *Lema balteata* and *L. concolor* (latter now in *Oulema*). Three new names were added by Linell (1898) with the descriptions of *Lema jacobina* (here placed in *Neolema*), *L. longipennis*, and *L. coloradensis*; the last two are here transferred to *Oulema*.

Blatchley (1913) described *Lema palustris* (now in *Oulema*). Schaeffer (1920) described *Lema arizonae* (now in *Oulema*); later (1933), in a more or less comprehensive treatment of the Criocerinae, he added the taxa *Lema trilineata medionota*, *L. margineimpressa*, *L. simulans*, and *L. palustris floridana* (last three now in *Oulema*). Brown (1938) described *Lema gaspensis*, a name now in *Oulema* and a synonym of *O. palustris*. In 1970 Kogan and Goeden (1970a) described *Lema trilineata daturaphila* from California. Balsbaugh and Hays (1972) in a work on the Chrysomelidae of Alabama raised both *Lema sexpunctata albini* and *L. s. ephippium* to the species level (both now in *Neolema*). White and Day (1979) recognized *L. trilineata trivittata* as a species, and not a subspecies. Monros (1960) listed world species of the Criocerinae and made nomenclatural changes.

Materials

Well over 10,000 specimens were examined during this study; about half of these specimens were from the U.S. National Museum of Natural History collection. Other sources of a large number of specimens include the California Academy of Sciences (nearly 1,700 specimens) and the Canadian National Collection (over 1,100 specimens). Additional collections from which specimens were examined are listed in "Acknowledgments." Each specimen identified during this work has been provided with an identification label.

Methods

Measurements	Measurement of the body length would seem to be uncomplicated, but it is not always so. The head of mounted specimens of Criocerinae is normally directed downward, but in some specimens it may be directed forward (see figs. 24, 30, and 43). Forward extension of the head can add to apparent body length, so when the head of a specimen was directed forward, I measured the body length from the anterior points of the eyes to the tips of the elytra.
Distinguishing Sexes	<p>Readily usable characters for distinguishing the sexes of these beetles are virtually nonexistent. For dissection of male genitalia, the smallest specimens from a series were selected and usually proved to be males.</p> <p>The character Myser and Schultz (1967) used to distinguish the sexes of <i>Oulema melanopus</i> is the form of the intercoxal process of the first abdominal segment: the process is more narrowly rounded and flat or concave in the male and more broadly rounded and convex in the female. With practice this character can be used effectively for this species.</p>
Genitalia Preparation	Before attempting to dissect the male genitalia, add some extra glue (I used Elmer's glue) to the mounting to ensure that the beetle is securely glued. Once this glue has dried, take a very sharp pin and carefully force the point between the hind coxae and the abdomen to loosen and eventually remove the abdomen. Soak the abdomen in an alcohol-water solution to loosen the internal parts. (I glued the extracted aedeagus to the side of the point with Elmer's glue and returned the abdomen to the specimen.) This procedure can generally be done with no damage to the specimen other than removal of the abdomen; but on occasion, I did not remove an abdomen when it became apparent that damage to the specimen could result. If a lengthy series is at hand, there will be more specimens that are likely males.
Larval Preservation	Mason and Lawson (1978:398) studied the effects of killing and preserving treatments on three species of leaf beetle larvae (including <i>Lema trilinea</i>). The killing treatments were boiling, use of KAAD (kerosene/alcohol/acetic acid/dioxane mixture), and use of 75% alcohol. Boiling was judged to be the best means of killing larvae of <i>Lema trilinea</i> whereas other treatments were found to be best for killing larvae of the other two species of leaf beetles. Effectiveness of the three means of killing larvae was judged on the basis of consistency of body length, freedom from integument collapse, and nonextension of body parts. In working with the larvae of <i>L. trilinea</i> , Mason and Lawson found that boiling increased the length by 27% over the live length, use of KAAD caused a 14% increase, and use of 75% alcohol caused a 4% decrease.
Full-Figure Illustrations	Figures 1–45 were drawn on Coquille board by the author. India ink was used for the outlines, and the shading was produced with the use of negro and charcoal pencils. Krylon workable fixative was sprayed over finished drawings to prevent smudging in handling. The small black figure above and to the right of each full-figure drawing shows the actual size of the beetle. Secondary highlights on a black background (as on the lower right margin of the elytra in figs. 26–30) were done with chalk or white pencil.

In figures 1–45 I have attempted to show the extent of the variation in color pattern or melanism on the head, pronotum, and elytra of the species by use of shaded partial drawings; variation in the color of the appendages is not shown. The absence of partial drawings (as in figs. 2 and 3) indicates that there was little or no variation in pattern or melanism among the specimens examined. If only a very small series of a species was available to me, it is possible that a population could exhibit pattern or melanistic variation of which I am not aware. In figures that include partial shaded drawings, the complete habitus drawing shows the typical condition for the species, and the partial shaded figures show the extremes of color variation, from the least amount of dark markings (upper drawing) to the greatest amount (lower drawing). Melanistic variation usually involves just the elytra but may also include the pronotum or the head and pronotum. Typically the species of *Lema* are patterned and variable, while those of *Oulema* are not patterned and are less variable. Variation in color of the species of *Oulema* generally involves dark markings on the pronotum only or melanism of this part. For further discussion of this variation, see the section “Diagnostic Characters.”

SEM Photographs

The 24 scanning electron microscope (SEM) photographs (figs. 46–69) were taken by the author using an Oxford S-100 SEM. Specimens were metal coated for the photographs. When a photograph did not bear a totally black background, but rather a pale one or one showing unwanted features, a black background was produced by painting over with India ink.

Maps

Maps were prepared to show the distributions of the species of Criocerinae (figs. 70–85). The number of marks on a map may be less than the number of localities recorded for a species, either because some obscure localities could not be located or because of insufficient room on the maps. For example, *Crioceris duodecimpunctata* has been collected from 11 localities in New Jersey, but not all the localities could be indicated on the map (fig. 70).

Genitalia Illustrations

The basic procedures used for making the full-figure illustrations were also used for figures 86–123.

To depict the form of the internal processes in my drawings (i.e., the very dark markings), I consulted photomicrographs, made with a Wild photomicroscope, of slides of cleared aedeagi. The chief problem in trying to show both the external form and the internal processes in one drawing is that the two aims can conflict. For example, drawing the aedeagus of *Neolema cordata* (fig. 102) was problematic because the internal processes obscured the external form.

The first of a pair of genitalic drawings is a lateral view. The second is a dorsal view of the anterior portion of the aedeagus.

Most of the aedeagi used for the illustrations had a large mass of soft tissue at their base; I have not depicted this in the drawings.

The internal processes of most aedeagi are clearly symmetrical in dorsal view. Whether asymmetry in the others is apparent (the result of drying or chemicals) or actual is not clear to me. Examples of asymmetry to which I refer are seen in figures 94, 111, and 115.

The drawings were made largely from dried-out genitalia. The appearance of a dried aedeagus can differ from that of a moistened organ. The chief difference is in the form of the apical area from a dorsal view; this region of a moistened aedeagus may be broader than that of a dried example, for drying may cause the sides below the apex to curl and become narrowed.

Nomenclature

Names Applied to Color Variants of *Crioceris* *asparagi*

Though there is appreciable color variation in *Crioceris asparagi* (and in some other species of *Crioceris*) too many earlier taxonomists described and applied names to color variants of the species. The infrasubspecific names proposed before 1961 must be carried in the literature. Some degree of forgiveness might be afforded these taxonomists because differences in color characters are often a basis for recognizing subspecies and providing them with names, and because in years past the nature of subspecies was not always clearly understood. The modern-day, clearer understanding of subspecies and availability of names for them, together with the unavailability of names for categories of lower rank, would seem to discourage application of infrasubspecific names. Though the names applied to color variants since 1960 do not have nomenclatural, taxonomic, or biological significance—or indeed any manner of real significance that I can bring to mind—this parade of useless names has continued even up to recent times (Szabolcs 1977).

Subgenera

Names that have been applied to subgenera are in this paper treated as synonyms.

Variation in *Lema* *trilinea*, *L. trivittata* Complex

I make no pretense to fully understand the color variations found in south-eastern specimens of *L. trilinea*, *L. trivittata trivittata*, and *L. t. medionota*. I refer to the variation in the black pigmentation of the head, the width of the lateral black stripe of the elytra, and the extent of the black markings of the tibiae. Most specimens of these taxa are readily distinguished by the characters given in the key; however, a few specimens are difficult to distinguish because the important diagnostic characters overlap.

Crioceris and *Lema* Type Species

The paper by Selman and Smith (1967) was an appeal to the Commission on Zoological Nomenclature to fix the type species of *Crioceris* and *Lema*. In preparing their paper the authors evidently did not see Monros' 1960 paper, for some discrepancies occur between data presented in the two papers. Selman and Smith stated that Chujo (1951) designated the type species of *Lilioceris* as *Attelabus lili* Scopoli. However, the first designation of type species was by Heinze, (1937) when he designated *L. merdigera* as type. In the same paragraph, Selman and Smith stated, "Therefore *Chrysomela asparagi*, together with the other species at present placed in the genus *Crioceris*, are in a genus without a name." The fact is that the following subgenera of *Crioceris* had been described: *Elisabethana* Heinze, *Manipuria* Jacoby, *Pseudolema* Jacoby, and *Sagrisma* Fairmair. Selman and Smith (1968) published emendations to the above paper. The opinion of the Commission on the 1967 appeal by Selman and Smith (Bulletin of Zoological Nomenclature 1970) fixed the type species of *Crioceris*, *Lema*, and *Lilioceris*, and these are cited herein.

Quoted Data

In this publication, State and provincial locations presented under the heading "Materials Examined" are excerpts of information on the labels of beetle specimens. Likewise, data identified as label data or literature notes and presented under the heading "Hosts" or "Host" are excerpts. An excerpt may be from one source or more than one source providing the same data. When presented consecutively in a sentence or list, excerpts are separated by semicolons. Quotation marks are not used but are to be understood.

Hosts

The North American species of *Lema* are most frequently recorded from plants of the families Solinaceae and Asteraceae but are also recorded from the families Rutaceae, Fabaceae, Hippocastaceae, and Malvaceae.

The hosts of species of *Neolema* belong most frequently to the Commelinaceae but also belong to the families Araceae, Asteraceae, Poaceae, Fabaceae, Polygonaceae, and Rosaceae.

The species of *Oulema* are most frequently recorded as having hosts that belong to the families Commelinaceae and Asteraceae. Recorded hosts also include plants of the families Cyperaceae, Rosaceae, Rutaceae, Fabaceae, and Poaceae.

The following information on hosts consists of literature notes and labels for specimens that were examined during this work.

Crioceris asparagi—asparagus.

C. duodecimpunctata—asparagus.

Lema balteata—on *Thurberia*; *Physalis*; feeding on *Solanum*, prob. *nodiflorum*.

L. circumvittata—nightshade.

L. confusa—*Datura stramonium*; *D. arborea*; *D. sauveolens*; *D. inozia*; *Physalis*.

L. conjuncta—swept from oak; on buckeye; on *Aesculus* sp.

L. melanofrons—adults, larvae, eggs collected on defoliated host plant *Physalis viscosum* var. *maritima*.

L. nigrovittata—on *Physalis*; on *Datura*; damaging poha; on eggplant and angel's trumpet; potato and belladonna; depredates.

Datura metalloides; oviposits on *Datura metel* and *D. tatula*.

L. opulenta—on Irish potato; on lettuce; from cotton; on corn leaves; on *Solanum triquetrum*; on squash foliage; *Gossypium hirsutum* L.

L. pubipes—on cucumber; on pigweed.

L. puncticollis—feeds on *Cirsium arvense*, also *C. drummondii*.

L. solani—on *Solanum nigrum*; on nightshade; on potato leaf; on tobacco; on *Solanum* foliage; on bean; on *Bombeya*; on cabbage.

L. trabeata—*Physalis pubescens*; *P. angulata*.

L. trilinea—*Solanum dulcamara*; on *Physalis alkekengi* L.; Japanese lantern; reared on potato; Chinese lantern; on *Physalis*; jimson weed; on corn; on sweet corn; on beans; on *Datura stramonium* L.; on *Nicandra physalodes* (L.) Gaertn. [sic]; feeding on belladonna.

- L. trivittata*—jimson weed; ex *Datura*; *D. stramonium* L.; *D. quercifolia* H.B.K.; in cornfield; on strawberry; on *Physalis*; on *Hyoscyamus*; on *Atropa bella-donna* L.; wild barley; on sunflower; cotton bud; bred from *Solanum*; on *Chamaesaracha conoides* Br.; wheat; on English pea foliage; on okra leaves; on *Melilotus indica* (L.) foliage; with parsley roots and leaves; *Solanum elaeagnifolium* Cav.
- L. trivittata medionota*—at *Physalis*; *Solanum* sp.; *Citrus sinensis*; on Irish potato; on lima bean leaves; on *Phaseolus vulgaris* leaves.
- Lilioceris lili*—feeds on *Lilium regale* and *L. tigrinum*.
- Neolema cordata*—on *Carex* leaves; swept ragweed; host *Commelina*; *C. diffusa*; *C. virginica*; *Rubus* foliage; on *Desmodium*; *Helianthus* sp.; at *Pisum*.
- N. ephippium*—on blossoms of thistle; on basswood, on *Zebrina pendula*.
- N. jacobina*—host *Commelina erecta*; reared on *Commelina communis*; host *Commelina communis*.
- N. ovalis*—wandering jew; host *Commelina communis*; day flower; watercress.
- N. sexpunctata*—bred from *Commelina nudiflora*; bred from *Commelina virginica*; host *Commelina communis*; on snapbean leaf; on *Festuca* sp.; on avocado leaves; *Philodendron panduræforme*; *Zebrina* sp.; on *Sesbania macrocarpa*; *Polygonum* sp.; reared from wandering jew; on dog fennel; from *Solidago*; hosts *Commelina erecta*, *Tradescantia virginiana*.
- Oulema arizonae*—larvae in flower sheath—*Commelina erecta*; *Senecio salignus*.
- O. brunnicollis*—*Cirsium*; on *Carduus*; on flowers of *C. spinosissimus* Walt.; on flowers and foliage of *C. horridulus* P.; on thistle.
- O. collaris*—spiderwort; on oats; on *Tradescantia virginiana*; on *T. ohienensis*; on *T. subaspera*; cut out of stems of *T. reflexa*; rare on thistles; feeds on thistle; *Cirsium lanceolatum*; taken on *Commelina* sp. (prob. *C. communis*).
- O. concolor*—on brake fern.
- O. cornuta*—on rice leaves; *Commelina communis*; on *Tradescantia*; swept from hoary lupine; swept from Natal grass.
- O. elongata*—on *Commelina erecta*; on *Tradescantia* sp.
- O. laticollis*—larvae and adults from *Tradescantia*, prob. *hirsuticollis*.
- O. longipennis*—on spiderwort.
- O. maculicollis*—on sweet potato leaves.
- O. melanopus*—from corn; winter wheat; grainfield; swept from oats; feeds on leaves of all cereals.
- O. palustris*—on *Tradescantia* sp.; on Canada thistle; eating leaf of *Carduus altissimus*; on calla lily blossom; host *Cirsium arvense* (L.); leaves and stems of *Cirsium*; on potato leaf, on morningglory leaf.
- O. sayi*—on *Carex* sp. leaves; on grass; on sugarcane leaf; on snap bean; on *Rubus* sp. foliage; on sweet potato leaves; on orange leaves; *Commelina*; on *Tradescantia virginiana*; from yellow thistle; from *Commylina* [sic] *virginica*; host *Commelina communis*; host *Citrus sinensis*; host *Phaseolus vulgaris*; host *Saccharum officinarum*.
- O. simulans*—*Commelina*; host *Commelina erecta*.
- O. texana*—on *Carex* sp. leaves; on Johnson grass leaf; on *Clitroa mariana*.
- O. variabilis*—on string beans; hibernating at stem roots of sedge grass; in rice field; on *Commelinia* [sic] *crispa* flowers; *Eupatorium wrightii*.

Life History Summaries

Below is a summary of the life history for the species of the Criocerinae, and it is followed by separate summaries for the genera *Lema*, *Neolema*, *Oulema*, and *Crioceris*. In the next section are presented summaries of published data for individual species.

At least partial life histories are available for two species of *Lema* (*trilinea* and *puncticollis*), two species of *Neolema* (*jacobina* and *sempunctata*), three species of *Oulema* (*melanopus*, *sayi*, and *simulans*), both species of *Crioceris* (*asparagi* and *duodecimpunctata*), and the species *Lilioceris lili*. Completeness of the histories varies greatly among the species. There is, however, sufficient data to allow generalizations to be made for the subfamily as a whole.

Criocerinae Summary

The species of Criocerinae overwinter as adults, but notes on one species indicate that the pupae also overwinter. Adults stridulate. They eat host plant parts or only the leaves, chewing holes in the leaves, or they make narrow furrows in leaves without eating the lower epidermis. Adult damage by some species is economically significant. Mating takes place in the spring, and a female will lay about 200–400 eggs over a period of 2–3 months (sometimes longer). One female was reported to produce 2,715 eggs (Kogan and Goeden 1970b). Females typically oviposit only during 1 year, but those of one species oviposit a second year. Eggs are usually laid in small groups and with one end attached to the foliage surface, but they may be laid singly. Some species lay eggs singly on foliage only rarely, others do so typically. The eggs are usually yellow and hatch in 2–10 days, but most often in 3–6 days. Larvae are white, yellow, or grayish, and those that feed on the surface cover the dorsum with their feces. When touched or disturbed, larvae eject a brown substance from their mouths. Larvae typically feed openly on the surface of foliage but may feed internally within berries, stems, or stamens. Larvae that feed internally back themselves to the burrow entrance to eject feces. When such larvae are forced to feed openly on foliage, they form a fecal covering over themselves. Larvae generally, but not always, have the same feeding habit as adults (i.e., chew holes or furrows in leaves). The larval stage lasts 5–24 days, but most often 8–15 days. Mature larvae pupate in the soil or beneath objects on the ground. Most larvae eject a white, foamy material from their mouths and form it around themselves to make a cocoon. This material hardens and becomes quite strong. A period of 8–22 days is spent in the cocoon before the adult chews its way out. The adult typically spends some days in the cocoon before emerging. There are generally one, two, or three generations per year, possibly more in southern, warmer areas. The higher figures for lengths of life stages generally apply to one of our largest species, *Lilioceris lili*.

Lema

Adults of the genus *Lema* typically overwinter, but the pupae of one species overwinter also. Eggs are usually laid in groups but sometimes singly. The total number of eggs laid per female ranges from 19 to 2,715. Eggs hatch in 2–6 days. Larvae feed openly on foliage, and the larval stage lasts from 5 to 20 days. Mature larvae descend to the ground and pupate in the soil or beneath objects on the ground. A period of 7–17 days is spent in the cocoon; adults remain in the cocoon for some days before emerging.

Neolema

Adults of the genus *Neolema* overwinter and chew holes in leaves. The number of generations per year is not known. Eggs are deposited singly or in groups on stems, leaves, or spathes. Larvae chew holes in leaves or feed on just one side of leaves. Larvae carry a mound of excrement on their dorsa; there are four instars. Mature larvae drop to the ground and form cocoons. Adults are formed after a pupal period of a week or more; they remain in the cocoon some days before emerging.

Oulema

Adults of the genus *Oulema* eat holes in leaves or chew long, narrow furrows into the leaf surface; they may feed on flowers. Eggs are laid singly or in groups and hatch in 2–15 days. Larvae feed openly on leaves or internally on stalks or spathes. Larvae that feed openly cover themselves with their feces; those that normally feed internally cover themselves with feces if made to feed openly; maturity is reached in 15–21 days. Larvae typically chew long strips between leaf veins. They enter the soil and form cocoons. There is one generation a year.

Crioceris

Adults of the genus *Crioceris* overwinter. They stridulate, and they feed exclusively on asparagus. Eggs are laid singly or in rows in April or May, and they hatch in 3–8 days. Larvae feed openly on foliage or internally in berries. Mature larvae descend to the ground, form cocoons, and pupate. The duration of the life cycle, i.e., from the time the egg is laid until the adult emerges, is normally 30 days but can be as short as 3 weeks during warm weather.

Species Life History Data

The primary source of the data presented for a species is given at the end of the presentation.

Lema puncticollis

Adult *L. puncticollis* overwinter. They copulate on young thistles from April to May; pearly white eggs are laid on both sides of leaves. Small larvae usually feed on the lower side of leaves, larger ones on the upper side. Larvae pupate in the soil within a cell of soil particles glued together with a foamlike secretion. The life cycle duration is unknown. There is one generation per year. (Slobodyanyuk 1976.)

Lema trilinea

Adult *L. trilinea* chew irregular holes in leaves. Feeding becomes irregular and finally ceases in late fall. Hosts are *Datura stramonium*, *Hyocyanus niger*, *Physalis lancolata*, *P. grandiflora*, *P. edulis*, *P. virginiana*. Adults overwinter, but overwintering of pupae has also been reported (Lugger 1899, Bethune 1909). Most reports give the number of generations per year as two. Eggs are laid in clusters of 2–21 eggs, the average being nearly 8. Five females were observed to deposit an average of 8 eggs per day over 68 days. The total of eggs per female was 290–2,715. Eggs are golden yellow to bright yellow, are oblong-oval, and hatch in 3–5 days. Larvae are 5–6 mm long and yellow; they may feed side by side as they move from leaf margin to leaf base. Larvae on a leaf may represent two or three different instars. Larvae cover their bodies with their own feces. When touched, larvae eject a spurt of brown material from their mouths; this action may be defensive. There are four instars. Larvae reach the fourth instar in 3–8 days and enter the soil 1–5 days later to form cocoons. After 10–17 days, adults are fully developed; they remain in their cocoons for several days before emerging. (Kaufmann 1967.)

Neolema jacobina

The host of *N. jacobina* is *Commelina erecta*. Adults chew gaping, irregular holes in leaves. New generations are produced continually from June to October. Females lay 0–45 eggs per day (average of 4.3 eggs per day) for 60 days. The total number of eggs laid per female over 60 days ranges from 19 to 416. Eggs are yellow, glabrous, and smooth. They are usually laid singly but are sometimes laid in groups of two to six. Eggs are deposited on stems, leaves, and spathes of plants. Egg incubation varies from 2 to 6 days. Larvae chew holes in leaves, as do the adults, and carry mounds of their excrement on their dorsa. Larvae are 4–5 mm long. When disturbed, they eject a brown liquid from their mouths. The duration of development from the first to fourth instar is 3–15 days. After 2–5 days as fourth instars, larvae enter the soil to form cocoons. Adults are formed after a pupal period of about 1 week but remain in the cocoons for several days before emerging. (Overwintering stage not mentioned; Kaufmann 1967.)

Neolema sexpunctata

Adult *N. sexpunctata* overwinter. The number of generations per year is not known. The host is *Commelina communis*. Adults eat holes in leaves; they stridulate. Eggs are deposited over 35 days on the underside of leaves, either singly or in small groups. Eggs are cylindrical, translucent, and white; have a smooth and shiny surface; and incubate for 2–6 days. Larvae are white with a translucent tan stripe down the back, and they feed for 5–13 days. Larvae feed on the epidermis on either side of leaves but do not eat holes in them as do the adults. They carry excrement on their backs. Larvae pass through four instars; when mature they drop to the ground and seek dark places under leaves or in trash to form cocoons. A white foamy substance that issues from the mouth is used to form the cocoon and becomes quite strong when dry. Eight days are spent in the cocoon, and the total time required for completion of the life cycle under optimum conditions is 22 days. (Green 1939.)

Oulema melanopus

The species *O. melanopus* feeds on leaves of all cereals and grasses, with barley, oats, and wheat being the cultivated plants most often damaged. One generation is produced per year (in Italy). Overwintered adults mate in spring, and females oviposit on host leaves for 45–60 days. Larvae hatch in 7–15 days and feed on leaves, migrating from leaf to leaf. Larvae pass through four instars, mature in 12–20 days, and are generally present from late April to mid June. They cover themselves with fecal material. Pupation occurs in earthen cells at depths of 1/2 to 2 inches, the adults emerging 20–25 days later. New adults feed from July to autumn, then hibernate beneath detritus until mid March. In England the life cycle spans about 46 days. Adults and larvae chew long strips between leaf veins; the chief damage is done by adults feeding in the spring and by larvae and adults feeding in warm weather. (U.S. Department of Agriculture 1958.)

Oulema sayi

Adult *O. sayi* eat holes in leaves. Eggs are deposited singly in folds of central leaves enclosing flower stalks; they hatch in 3–4 days. Larvae are pearly white with a black spot on the back of the second segment and are about 7 mm long. Larvae are found on *Commelina virginica*, and they eat down into the soft stalk, rarely extending their burrows more than 50 mm. Larvae back themselves to the top of their burrows and eject feces outside. A few larvae have been found eating externally; these had a partial covering of feces. (Richardson 1893.)

Oulema simulans

The host plant of *O. simulans* is *Commelina erecta*. Adults chew long, narrow furrows into leaf surfaces and ultimately eat all but the lower epidermis and principal veins of leaves; adults may also feed on flowers. Eggs are usually laid singly, but are sometimes laid in groups of two to six on stems, leaves, and spathes. Eggs incubate for 2–6 days. Larvae are 4–5 mm long and feed in closed spathes on the androecia and gynoecia. Larvae fed only leaves can attain adulthood. Within spathes, larvae do not develop excrement coverings, but they do when fed only leaves. When touched, larvae eject a brown material from their mouths. Larvae have four instars and reach the fourth instar in 5–21 days. Between 3 and 6 days into the fourth instar, they enter the soil and form cocoons. Generally adults form after a pupal period of about 1 week, and they remain in the cocoons for several days after metamorphosis. (Kaufmann 1967.)

Crioceris asparagi

Adults of *C. asparagi* overwinter; they stridulate. This species feeds exclusively on asparagus, the adults dodging around stems when disturbed. Eggs are laid in April or May and are placed on their end, usually in rows of two to seven or more, on the stems or foliage of developing stalks. Eggs hatch in 3–8 days. Mature larvae are dark gray or olive and enter the earth to form cocoons. Pupae are yellow and metamorphose into adults in 5–8 days. The time span from egg to adult is about 30 days but can be as short as 3 weeks during hot weather. In its northern range this species produces two or three generations per year, but farther south it produces four or five generations. Injury to asparagus is due to both adults and larvae, which feed on the tender shoots and foliage of taller plants. (Chittenden 1907.)

***Crioceris
duodecimpunctata***

Adult *C. duodecimpunctata* overwinter; they stridulate. The chief damage to asparagus, its only host, is caused in spring by adults feeding on young shoots. Later in the growing season, both adults and larvae of later generations feed exclusively on berries, the larva feeding within ripening berries. Adults normally take flight when disturbed. Eggs are attached (but not on end) to older plants near the end of shoots and along their sides. Larvae are orange and therefore easily distinguished from those of *C. asparagi*. Larvae move from one berry to another to complete their development; when grown they drop to the ground and pupate. (Chittenden 1908.)

Lilioceris lili

The food plants of *L. lili* are *Lilium giganteum*, *L. regale*, *L. tigrinum*, *Fritillaria*, and *Polygonatum*. The life cycle exceeds 1 year, and the females can oviposit in 2 successive years. Adults overwinter, and two generations are produced per year. Lengths of life stages are as follows: Egg, 8–10 days; larva, 16–24 days; pupa, 20–22 days. Females normally lay between 200 and 300 eggs, depositing them in irregular groups of 3–12 on larger leaves. One female observed laid 367 eggs from March to August of one year, and 160 during March and April of the following year. Larvae cover themselves with their excreta. Larvae are dirty yellow and feed on leaves of the host and on flowering stems; complete defoliation may occur. When fully fed, larvae descend to the ground and pupate. (Fox-Wilson 1942.)

Diagnostic Characters

Head

Characters of the head are important in distinguishing the genera of Criocerinae. Therefore the head parts offering the distinguishing characters are here discussed. The clypeus is immediately behind the movable, flaplike labrum. The clypeus and frons are fused, and no clear suture shows their union. I consider the lower limit of the frons as just below the level of the antennal insertions and consider the lateral limits at the eyes. The front of the head bears deep, somewhat X-shaped grooves; the lower arms of the grooves are contained in the frons, while the upper grooves I accept as marking the division between the frons and the vertex. The grooves, or head sutures, are clearly shown in some drawings (as in figs. 24 and 25) and less clearly shown in others (as in fig. 23). This difference in clarity is due to the attitude of the head of the specimens selected for the drawings and does not indicate differences in the species. The sutures are clearly visible when the head of a specimen is directed forward but are less so when the head is directed downward.

Tarsal Claws

Another key generic character is the nature of the tarsal claws, i.e., whether or not they touch at the base. In the species of *Liliocerus* and *Criocerus* the claws diverge immediately upon arising from the base and do not touch basally (figs. 46, 47). In species of *Lema* and *Oulema* the claws arise essentially parallel from the base before diverging apically, so they touch at the basal one-third to one-half (figs. 48, 49).

Color and Color Patterns

Lengthy explanations of diagnostic morphological characters for distinguishing species are not necessary because color and color patterns are usually diagnostic, especially in species of *Lema* and, to a lesser extent, in species of *Oulema*.

The color of the dorsum can serve as a more or less reliable guide to distinguishing the species of *Lema* and *Neolema* from those of *Oulema*. Except for *Oulema gundlachiana* and *O. coalescens*, all beetles with bicolored elytra (i.e., with stripes, bands, spots, or light margins) belong to *Lema* and *Neolema*. One species, *Neolema jacobina*, may have the elytra light throughout. Almost invariably if elytra are dark throughout, the species is a member of the genus *Oulema*. *Lema puncticollis* is the only species of the genus with elytra dark throughout. Of the 18 species of *Oulema* that have dark elytra, 16 have a more or less reddish pronotum, while the other 2 have an entirely dark pronotum. The reddish pronotum of 4 of the 16 species of *Oulema* may also be mostly dark or have dark markings.

Diagnostic color characters are generally among the most readily used of all characters available for distinguishing different insect species, and many leaf beetles, including the Criocerinae, exhibit such color characters. However, appreciable variation in these color characters can greatly complicate attempts at identification; such variation occurs in the Criocerinae. As previously mentioned, the extent of this variation is shown in the partial drawings in figures 1–45.

Species of *Lema* and *Neolema* are typically patterned, and often a pattern varies among members of a species. Species of *Oulema* typically are not patterned. Variation in color of the species of *Oulema* generally involves dark markings on or melanism of the pronotum only.

A simple variation in dark markings is shown by *Crioceris duodecimpunctata* (fig. 4 a–b). The full-figure drawing shows the typical condition, while the upper, partial drawing (fig. 4a) shows the smallest number and size of the dark elytral spots. One specimen of the hundreds that were examined showed that the lower spots can be large enough to nearly touch one another.

Note that for some species the variation in dark markings is in one direction only—either reduction or enlargement. For example, reduction only is shown by the dark stripe in *Neolema jacobina* (fig. 1a) and by the dark stripes in *L. melanofrons* (fig. 6a) and *L. nigrovittata* (fig. 12a). In *Neolema ovalis* variation is shown in both directions, although there is a greater tendency toward reduction of the dark elytral marking than toward enlargement (fig. 20 a–b). Variation in the direction of enlargement only is evident in the dark markings on *Neolema adunata* (fig. 22a). Only seven specimens were seen.

Note that in *Lema balteata* (fig. 19 a–b) both the elytral pattern and pronotal color vary. The pronotal color varies from typical black to the atypical completely light with no black markings. In some species the variation can be complex, as in *Lema trilinea* (fig. 7 a–c) and *L. opulenta* (fig. 15 a–c).

In most species, enlargement or reduction of the markings on the pronotum and elytra occur together; that is, a single specimen will show either the least or greatest development of dark markings on both the pronotum and elytra. In *Crioceris asparagi*, however, the direction of variation in the dark markings of the pronotum may be the same as or opposite from the direction of variation in the markings on the elytra. That is the reason that the small pronotal drawings of *C. asparagi* (fig. 5 a–c) are shown separately from the partial elytral drawings (fig. 5 d–e). Of all North American Criocerinae, this species shows the greatest extent of pattern variation.

Some of the pattern variations shown in the partial drawings are infrequent or rare. In species discussions, I often note the frequency of occurrence of the variations shown in the drawings.

Striae

Procedures used in counting the striae should be discussed. A few species have a short scutellar row of little more than 5–10 punctures. Such a partial row is not counted. The first counted row of punctures usually extends nearly the length of the elytra, i.e., no less than half the elytral length. The striae are nearly always quite regular and easily counted; only those of *Neolema quadriguttata* are of confused punctation and difficult to count.

Tubercles

References in the key to the frontal tubercles of certain species of *Oulema* can cause problems if the tubercles are only somewhat developed. Frontal tubercles are the most highly developed in *O. texana* (figs. 42, 64, 65), *O. palustris* (figs. 44, 62, 63), and, to a lesser extent, *O. brunnicollis* (figs. 45, 58, 59). However, tubercle development varies from strong to moderate in *O. cornuta* (figs. 40, 60, 61) and from moderate to weak in *O. simulans* (figs. 35, 56, 57). Members of the last two species that exhibit one extreme of variability or the other can be difficult to key properly. The variation is greatest in specimens of *O. simulans*, and the most problems are encountered in keying this species.

Aedeagi

In general the aedeagi of the species of *Lema* are of limited value in distinguishing closely related species. Both the external form and form of the internal processes can be nearly identical in related species. The aedeagi of the species of *Oulema* seem to be of value for distinguishing closely related species, for the aedeagi show more variation between species in external form and shape of the internal processes than do the aedeagi of the species of *Lema*. Like the aedeagi of *Oulema*, those of the species of *Neolema* offer characters useful in distinguishing species.

Abbreviations

The abbreviations below are used in referring to the sources of type and other specimens used in this work.

BMNH	British Museum of Natural History, London
CASC	California Academy of Sciences, San Francisco
CNCI	Canadian National Collection, Ottawa
EGRC	Edward Riley collection, College Station, Texas
FSCA	Florida State Collection, Gainesville
MCZC	Museum of Comparative Zoology, Harvard University
MNHP	Muséum National d'Histoire Naturelle, Paris
NCAC	Nevada Department of Agriculture, Reno
NMDC	N.M. Downie collection, Lafayette, Indiana
OSUC	The Ohio State University, Columbus
TAMU	Texas A&M University, College Station
UMRM	University of Missouri, Columbia
USNM	United States National Museum of Natural History, Smithsonian Institution, Washington, DC

Criocerinae

The references that follow are highly selective and are just some of the most significant.

Emmons, 1854:17; Clark, 1866:19; Crotch, 1873a:19; Blatchley, 1910:1110; Leng, 1920:287; Brisley, 1928:116; Böving and Craighead, 1931:65; Chen, 1940:451; Wilcox, 1954:376; Varma, 1955a:18; Varma, 1955b:189; Gressitt and Kimoto, 1961:36; Arnett, 1968:903; Seeno and Wilcox, 1982:27.

Diagnosis

Frons not inflexed; antennal insertions separated by width of frons; dorsum glabrous; pronotum lacking a lateral margin, narrower than elytra; elytral punctures in distinct rows; abdominal sterna not markedly narrowed medially; pygidium covered by elytra.

Description

General

Length 2.7–8.0 mm; body elongated, elytral sides subparallel, head and pronotum clearly narrower than elytra; body always glabrous above, more or less pubescent below.

Head

Prominent from above, usually about as wide as pronotum, sometimes a little wider, rarely much narrower. Eyes prominent, broadly to narrowly emarginate adjacent to antennal insertions. Front of head with distinct, deep furrows, forming roughly an X pattern; surface with more or less sparse pubescence. Antennae 11-segmented, about 2/5 to 2/3 as long as body; 1st 3 or 4 segments shortest, remaining segments elongated and usually more or less broadened. Last segment of maxillary palpus elongated, subcylindrical to subconical.

Prothorax

Width roughly equal to length; usually constricted near middle, sometimes weakly so basally, often with a small basal depression; surface usually smooth and shiny; punctation often most prominent anteriorly and along midline; anterior coxal cavities closed.

Elytra

Generally about 2 times as long as wide; humeri prominent; punctures large, strong, prominent, clearly aligned in longitudinal rows, strongest basally, weakest apically.

Abdomen

First segment easily longest, about equal in length to 3 following segments; segments 2, 3, 4 progressively shorter, segment 5 about equal in length to segment 2. Sexual dimorphism feeble to (usually) absent.

Legs

Femora broadened medially, often hind femora clearly broader than others; hind tibia with 1 or 2 small, apical spurs; 1st tarsal segment a little longer than 2d; segment 3 broadly bilobed; tarsal claws divergent and simple or touching basally.

Biology

Female Reproductive System

Mann and Singh (1979:89) illustrated and discussed the female reproductive system and external genitalia of six species of *Lema* collected in India. They found that the shape and size of the spermatheca, spermathecal gland, spermathecal duct, ligula, and genital chamber with its abdominal appendages offer important taxonomic characters.

Varma (1955b:189) studied the value of the characters of the spermathecal capsule for distinguishing the subfamilies of Chrysomelidae; the data collected apply to species found in India. He described the spermathecal capsule of the Criocerinae as anchor shaped and divisible into two parts: the basal two-thirds is a uniformly broad, bow-shaped stem, and the posterior one-third is comma shaped. Varma's paper includes illustrations of the spermathecal capsule of 32 species of Chrysomelidae, but the illustrations are very difficult to compare and homologize, for they are placed in differing attitudes and positions.

Sexual Dimorphism

Perhaps the best indicator of sex is body size, the females generally being larger than males. Thus if the largest specimens in a series of a species are separated out, they will nearly always be females.

Chromosomal Characters

Petitpierre (1980:179) studied six species of Criocerinae and found the chromosome numbers and sex-determining systems. The species studied included *Oulema melanopus*, *Crioceris asparagi*, *C. duodecimpunctata*, and *Lilioceris lili*.

Mimetic Resemblances

Gahan (1891:367) discussed 18 cases of possible mimicry between species of *Lema* and *Diabrotica*; 10 of these were illustrated. One case involved resemblances between *Lema nigrovittata* Guer. and *Diabrotica vittata* Fab. This is the only case concerning a North American species. Five cases were of Central American species.

Stridulating Organs

Gahan (1900:433) reported two areas of stridulation in *Lema* and *Crioceris*, both areas being located on the pygidium. He also noted that there are no special scraping ridges on the elytra in *Lema* and *Crioceris*. Dingler (1932:705) discussed the morphology and operation of the stridulating organs of *Crioceris asparagi*.

Larval Morphology

Saunders (1943 a-b) published the comparative morphology and taxonomy of some larval Criocerinae. Included in this work are the following species (with the number of pages of data): *Crioceris asparagi* (5 1/2 pp.), *C. duodecimpunctata* (1 p.), *Lema trilinea* (6 pp.), *L. sexpunctata* (5 pp.). Saunders's larval key to subfamilies of Chrysomelidae includes the species studied and larval characterizations.

Higher Classification

In North American literature there is general agreement that the Chrysomeloidea consists of the Cerambycidae, the Chrysomelidae, and the Bruchidae; however, in other parts of the world there is some disagreement with this classification. For example, Chen (1985) recognized six distinct families, including Megalopodidae, Cerambycidae, Crioceridae, Chrysomelidae, Eumolpidae, and Hispididae. Under the Crioceridae, Chen recognized four subfamilies: Sagrinae, Bruchinae, Donaciinae, and Criocerinae. According to Chen the Crioceridae possess two important characters that show their close relationship to the Megalopodidae: the prognathous head and the laterally unbordered thorax.

Seeno and Wilcox (1982:4-9) reviewed the various classifications proposed for the groups of Chrysomelidae. On the basis of the exerted head and narrow, unmarginated prothorax, the Criocerinae is in nearly all systems classed as one of the most primitive groups of the family. In the Chapuis system as modified by Jacoby, the most primitive division, Eupoda, comprises the Sagrinae, Donaciinae, Orsodacninae, and Criocerinae.

Verma (1985:485) studied the male reproductive organs as taxonomic characters for a classification of the Chrysomelidae. He found two natural groupings of the subfamilies studied, as follows: (1) Galerucinae and Alticinae—having nonseptate testis follicles and aedeagus without a basal muscular bulb and (2) Cassidinae, Hispinae, Criocerinae, Clytrinae, Chlamysinae, Eumolpinae, and Chrysomelinae—having septate testis follicles and aedeagus with a basal muscular bulb.

Phylogeny of Criocerinae

The most recent conjectured phylogeny of the genera of Criocerinae was made by Schmitt (1985). He stated that the Criocerinae can be arranged into three probably monophyletic groups: the *Lilioceris* group (*Ovamela*, *Metopocerus*, *Lilioceris*, and *Mecoprosopus*), the *Crioceris* group (*Crioceris*, *Elisabethana*, *Sigrisma*, and *Manipuria*), and the *Lema* group (*Trichonotolema*, *Atactolema*, *Lema*, *Mimolema*, *Oulema*, *Ortholema*, *Incisolema*, *Plectonycha*, *Stethopachys*, *Lagriolema*, and *Papulema*).

Schmitt proposed a dichotomous phylogeny, with the *Lilioceris* group forming the first split and the *Crioceris* and *Lema* groups forming the next split. Distinctive characters for each group follow: *Lilioceris*—divided vertex; *Crioceris*—specialized on asparagus feeding; *Lema*—fused claws.

Generic Assignments

A former subgenus (*Neolema*) is here recognized as a genus, and a number of species are reassigned generically; therefore, directly comparable diagnoses are given beneath the treatments of the affected genera, i.e., *Lema*, *Neolema*, and *Oulema*.

The best evidence that the genera *Lema*, *Neolema*, and *Oulema* are natural groups is to be found in the form of the aedeagi. These organs are described in the diagnoses.

List of Criocerinae of North America

Lema balteata LeConte

peninsulae Crotch
circumvittata Clark
confusa Chevrolat
bivittata Lacordaire
virgata Lacordaire
fasciaticollis Pic
conjuncta Lacordaire
maderensis White, new species
melanofrons White, new species
nigrovittata (Guérin)
notativentris Schaeffer
opulenta Gemminger & Harold
ornata Baly
lebioides Linell
pubipes Clark
puncticollis (Curtis)
cyanella (Linnaeus)
rugicollis Suffrian
obscurior Pic
solani Fabricius
trabeata Lacordaire
trilinea White
trilineata Olivier
nigriventris Fall
californica Schaeffer
daturaphila Kogan & Goeden
trivittata trivittata Say
immaculicollis Chevrolat
trivirgata LeConte
lecontei Clark
nigrovittata Schaeffer (not Guérin)
t. medionota Schaeffer

Neolema adunata White, new species

cordata White, new species
albini Auctorum
ephippium (Lacordaire)
gundlachiana (Suffrian)
intermedia (Suffrian)
jacobina (Linell)
ovalis White, new species
quadriguttata White, new species
sempunctata (Olivier)
sexmaculata Germar
albini (Lacordaire)

Oulema arizonae (Schaeffer)

brunnicollis (Lacordaire)
coalescens White, new species
collaris (Say)
concolor (LeConte)
cornuta (Fabricius)
elongata White, new species
laticollis White, new species
longipennis (Linell)
maculicollis (Lacordaire)
marginempressa (Schaeffer)
melanopus (Linnaeus)
atrata Waltl
waltli Heinze
melanoventr White, new species
minuta White, new species
palustris (Blatchley)
floridana (Schaeffer)
gaspensis (Brown)
sayi (Crotch)
simulans (Schaeffer)
texana (Crotch)
coloradensis (Linell)
variabilis White, new species
texana Auctorum

Crioceris asparagi (Linnaeus)

campestris Rossi
cruciata Schuster
normalis Schuster
trifasciata Schuster
pici Heyden
impupillata Heyden
schusteri Heyden
sexsignata Heyden
duodecimpunctata (Linnaeus)
abeillei Pic

Liliocerus lili (Scopoli)

merdigera (Fabricius)
liliorum (Thomson)

Key to North American Genera of Criocerinae

1. Tarsal claws touching at basal 1/3 to 1/2; figs. 48–492
Tarsal claws not touching at base; figs. 46–474
- 2(1). Ninth elytral stria with a gap of 5–12 punctures; yellow, orange,
or red and elytra nearly always with 1–4 black spots
(figs. 1, 20–25) *Neolema*
Ninth elytral stria complete; if bearing a gap, then elytra black
throughout3
- 3(2). Antennal tubercles touching or clearly more near to one another
than are frons and vertex (figs. 54–65); elytra entirely black or
very dark and usually with a blue or green reflection (figs. 28–45),
rarely bicolored (figs. 26–27); prothoracic constriction weaker
and more basal; length 2.7–6.5 mm *Oulema*
Frons and vertex more near to one another than are antennal
tubercles; elytra usually bicolored, with bands or stripes, or at
least with lateral margin light (figs. 6–25); elytra rarely entirely
dark (fig. 3); prothorax distinctly constricted medially; length
4.0–8.0 mm *Lema*
- 4(1). Elytra entirely yellow, without markings (fig. 2); prothoracic
sides strongly constricted medially; 6.3–7.3 mm *Liliocerus*
Elytra with dark spots or a pattern (figs. 4–5); prothoracic
sides arcuate, feebly constricted near base;
length 4.7–6.6 mm *Crioceris*

Lema Fabricius

Lema Fabricius, 1798:90 (feminine); Dejean, 1821:114; Suffrian, 1841a:19;
Lacordaire, 1845:303; Clark, 1866:23; Crotch, 1873:24; Lacordaire
and Chapuis, 1874:72; Gahan, 1891:367; Gahan, 1900:451; Jacoby and
Clavareau, 1904:5; Blatchley, 1910:1110; Clavareau, 1913:5; Leng,
1920:287; Lucas, 1920:366; Blatchley, 1924:39; Brisley, 1928:117;
Chagnon, 1937:226; Blackwelder, 1946:628; Wilcox, 1954:377; Monros,
1960:181; Gressitt and Kimoto, 1961:59; Heinze and Pinsdorf, 1964:509;
Gressitt, 1965:148; Selman and Smith, 1967:116; Arnett, 1968:905;
Balsbaugh and Hays, 1972:17; Wilcox, 1974a:6; Wilcox, 1974b:8; Seeno
and Wilcox, 1982:27; Bulletin of Zoological Nomenclature, 1970:12. Type
species, *Lema cyanea* Fab., 1798; fixed by the International Commission on
Zoological Nomenclature (Bulletin of Zoological Nomenclature 1970).

Petauristes Latrielle, 1829:136 (subgenus). Type species, *Lema crassipes*
Olivier.

Bradylema Weise, 1901:146. Type species, *Bradylema rusticella* Weise.

Sulcatolema Pic, 1928:96. Type species, *Lema coromandeliana* Fab.

Pseudolema Pic, 1928:96. Type species, *Pseudolema suturalis* Jacoby.

Bradylemoides Heinze, 1930:28. Type species, *Crioceris grossa* Thomson.

Microlema Pic, 1932:33. Type species, *Lema quadrimaculata* Gebler.

Enoplolema Heinze, 1943:23. Type species, *Lema adhaerens* Weise.
Quasilema Monros, 1951:468 (as subgenus). Type species, *Lema apicalis* Lacordaire.
Pachylema Monros, 1951:473 (as subgenus). Type species, *Lema violacea* Lacordaire.

Diagnosis

Frons and vertex more close to one another than are antennal tubercles, and apex of frons located between antennal tubercles. Prothoracic constriction strong, median. Elytra often striped, with dark markings on a light background, sometimes with broad dark markings on light background, sometimes predominantly dark, with light transverse band, or predominantly to completely dark; punctures small to moderate in size and well aligned; 9th stria complete. Aedeagus in lateral view slender, broadest at about apical 1/3, with apical margin generally concave; in dorsal view apical concavity overlaid by a single, broad lobe; internal processes from dorsal view often of a human-like form.

Description

General

Length 4.0–8.0 mm.; basal color usually yellow or orange; dorsum nearly always with dark stripes, bands, or other markings.

Head

An antenna about 1/2 as long to about 4/5 as long as body; outer antennal segments often more or less expanded. Vertex not enlarged; grooves on front distinct and deep, forming an X. Frons and vertex more near to one another than are antennal tubercles; apex of frons located between antennal tubercles. Eye notch usually deep and extending to 1/4 past middle of eye. Head strongly constricted behind eyes.

Pronotum

Width typically a little greater than length; constriction nearly always median and deep; surface nearly always smooth and shiny; punctures of moderate size, located medially in a longitudinal band from anterior margin to near base and also anteriorly on each side.

Elytra

Each elytron with 10 striae of usually clearly aligned punctures; punctures small to moderate in size (smaller apically); sutural stria absent; 9th stria with no gap; elytra about 1.5 times as long as wide.

Ventral surface

Tarsal claws touching basally.

Species Groups of *Lema*

The species of *Lema* can be separated into four rather easily distinguished groups on the basis of color pattern. I have found no morphological basis for grouping species.

The first group consists of species with more or less clearly developed dark, narrow elytral stripes on a yellow background. The species are *L. trilinea*, *L. trivittata*, *L. nigrovittata*, *L. maderensis*, *L. pubipes*, and *L. melanofrons*. These species generally bear pronotal spots; but this is a variable character, and individuals of at least four of the species may lack these. The body length varies from 4.5 to 8.0 mm.

The most similar species in this group are *L. trilinea* and *L. trivittata*, and certain specimens are difficult to place with certainty. The species *L. pubipes* and *L. melanofrons* are also quite similar; they show the least development of the elytral stripes. *Lema maderensis* and *L. nigrovittata* are similar in having lateral pronotal spots and partly black femora.

The dark elytral markings of *L. confusa*, *L. trabeata*, and *L. opulenta* indicate clear relationships among the second group of species. Within this group, *L. confusa* and *L. trabeata* are the most similar. The body length ranges from 4.0 to 6.7 mm.

Dark elytra with a transverse light band are distinctive for *L. balteata* and *L. solani*, which constitute the third group. The legs are dark and the length range is 4.8 to 7.5 mm.

Lema circumvittata and *L. conjuncta*, which make up the fourth group, have elytra predominantly dark but with light lateral margins and often a light basal area. The head, pronotum, ventral surface, and femora are light; the tibiae, all or mostly dark; and the tarsi, dark. The length ranges from 5.8 to 7.4 mm.

Only *Lema puncticollis* has not been assigned to a group. Among North American species it stands by itself because the body is black throughout.

Key to species of *Lema*

1. Entire body black; dorsum with a blue reflection
(fig. 3) *puncticollis* (Curtis)
Color not as above, body bicolored 2
- 2(1). Head all or predominantly dark 3
Head partly black, partly light, to completely light 9
- 3(2). Dorsum predominantly light; pronotum usually with 2 black
markings; elytra nearly always with 3 relatively narrow black
stripes (see figs. 7, 11, 12) 4
Color not as above (see figs. 13, 14, 18, 19) 6
- 4(3). Pronotal dark markings discal, usually of 2 spots, sometimes
expanded and covering most of disk (fig. 7) *trilinea* White
Pronotal dark markings lateral or absent, never on disk 5
- 5(4). Outer dark stripe of an elytron narrow and on 5th or 6th to 7th
intervals (interstriae); abdomen usually primarily light
(fig. 12) *nigrovittata* Guérin
Outer dark stripe of each elytron broad and on 6th or 7th to 9th
intervals; abdomen mostly dark (fig. 11) *maderensis*, n. sp.
- 6(3). Elytra mostly dark with a median, transverse light band,
which is sometimes discontinuous at suture 7
Elytral color not as above 8

- 7(6). Lateral margin of elytra light except at extreme apex (fig. 18);
New Jersey to Florida to Texas *solani* Fab.
Lateral margin partly light, partly dark (fig. 19);
Arizona *balteata* LeC.
- 8(6). Each elytron black with a median light stripe (fig. 13); southern
Florida *confusa* Chev.
Each elytron black with a pattern of basal and apical light
markings that may be expanded and joined (fig. 14); Florida
to Arizona *trabeata* Lac.
- 9(2). Elytra mostly black with lateral margin orange to yellow 10
Elytra not as above 11
- 10(9). Elytron with basal light marking broad and extending 1/8 to
nearly 1/2 length of elytron (fig. 17) *conjuncta* Lac.
Elytron with basal light marking lacking or narrow and extending
not over 1/10 length of elytron (fig. 16) *circumvittata* Clark
- 11(9). Elytra with distinctive dark pattern (see fig. 15) *opulenta* G. & H.
Elytral pattern of narrow stripes, not as above 12
- 12(11). Elytra light nearly throughout; if partial to complete lateral vitta
present on elytron, vitta at its widest spanning less than
2 intervals 13
Elytra with complete lateral vitta, at its widest spanning 2 or
more intervals 14
- 13(12). Black band present between eyes (fig. 6); coast of North Carolina
and Alabama *melanofrons* n. sp.
No black band between eyes (fig. 10); Southwestern
United States *pubipes* Clark
- 14(12). Lateral elytral vitta wide, on 3 or more intervals 15
Lateral elytral vitta narrow, on 2–2 1/2 intervals 16
- 15(14). Interocular area with a black marking ranging from spot to band;
lateral elytral dark stripe spanning 2–4 intervals at midlength
(fig. 8); Southeastern United States
(fig. 77) *trivittata medionota* Sch.
Interocular area light, rarely with black; lateral elytral dark stripe
on 3–4 or more intervals (fig. 7); nearly throughout
United States (fig. 84) *trilinea* White
- 16(14). Interocular triangle all to partly black; black on tibiae usually at
apical 1/2 or more, rarely less than 1/2 (fig. 8); occurring in
Southeastern United States (fig. 77); *trivittata medionota* Sch.
Interocular triangle usually pale or spotted, rarely mostly black;
tibiae black at tip to apical 1/3 (fig. 9); nearly throughout
United States, but only part of Southeast
(fig. 85) *trivittata trivittata* Say

***Lema balteata* LeConte**
(figs. 19, 73, 89)

Lema balteata LeConte, 1884:24; Henshaw, 1885:105 (N. Amer. checklist); Jacoby and Clavareau, 1904:15 (world catalog); Schaeffer, 1905:169 (taxonomy); Snow, 1907a:20 (distribution); Clavareau, 1913:55 (world catalog); Leng, 1920:287 (N. Amer. checklist); Schaeffer, 1920:320 (taxonomy); Brisley, 1928:118 (in key); Schaeffer, 1931:148 (taxonomy); Schaeffer, 1933:306 (taxonomy and in key); Blackwelder, 1939:61 (N. Amer. checklist); Monros, 1955:44 (taxonomy); Leech and Green, 1955:27 (biology); Monros, 1960:209 (world checklist); Wilcox, 1974a:6 (N. Amer. checklist); Wilcox, 1974b:8 (Amer. checklist).

Lema peninsulae Crotch, 1873:25; Leng, 1920:287 (N. Amer. checklist); Wilcox, 1974b:8 (Amer. checklist).

Lema balteata equestris Lacordaire: Schaeffer, 1933:306 (misapplication).

Diagnosis

Elytra mostly dark with a median, transverse light band (sometimes reduced to a spot); lateral elytral margin partly light and partly dark, or all dark.

Description

General. Head, antennae, prothorax, most of elytra, mesosternum, metasternum, and legs dark brown to black; elytra with a broad, transverse, median yellow to orange band extending to lateral margin, dark parts of elytra usually with a bluish reflection; abdomen yellow to orange; dorsal body surface shiny.

Color Variation. Head sometimes orange basally; prothorax partly to entirely orange; transverse elytral band may be broken at suture or (rarely) may be reduced on each elytron to a large discal spot plus smaller lateral spot; apex of elytron with yellow to orange markings ranging from 1 to 2 spots to an arcuate band; mesosternum and metasternum sometimes yellow to orange medially; rarely abdomen partly dark basally.

Head. An antenna a little less than 1/2 as long as body; vertex with fine, irregular punctation; clypeus with fine and coarse punctation.

Pronotum. Slightly wider than long, width slightly greater at base than at apex; constriction median, width at constriction 83% of width at base; surface with scattered, fine punctation and also with moderate-sized punctation located medially from apex to near base and apically on each side; at basal 1/3 shallow, transverse depression, usually with a median pit.

Elytra. Punctures of striae not close; 3d stria with 9–11 punctures in basal 1/2; 9th stria complete; interstriae with distinct fine punctation; disk with a weak transverse depression at basal 1/4 interrupted by suture.

Ventral Surface. Metasternum smooth throughout, with fine and very sparse punctures nearly evenly distributed; abdomen smooth, with fine and sparse punctation.

Length. Body 5.3–7.5 mm.

Aedeagus. In lateral view (fig. 89) widest apically, apical tip weakly inclined upward, upper apical margin weakly concave; in dorsal view sides subparallel, orifice overlaid by a single, large, broad lobe; internal processes symmetrical, vaguely of a slender human form.

Type Material

The holotype of *L. balteata* is MCZ No. 4357 and bears the datum "Ariz."

Material Examined

A total of 242 specimens were examined. The specimens were collected in the following locations. **Arizona**—Huachuca Mts.; Palmerlee, Cochise Co.; Globe; Fish Creek; Oracle; Chiricahua Mts.; Catal Mts.; Baboquivari Mts.; Portal; Base Pinal Mts.; Florida Canon, S. Rita Mts.; Ruby; Mt. Lemmon; Sta. Catalina Mts.; Pajarito Mts.; Santa Cruz Co.

Distribution

All U.S. specimens of *balteata* I examined are exclusively from the southeast quadrant of Arizona (fig. 73). I examined two specimens from Mexico, both taken at Los Mochis, Sinaloa.

Hosts

The following are the only label data concerning hosts: On *Thurberia*; *Physalis*. Leech and Green (1955:27) recorded *L. balteata* "feeding on *Solanum* sp., prob. *S. nodiflorum* Jacq."

Remarks

Schaeffer applied the name *equestris* to the form whose pronotum is partly to completely red. I examined examples of this form from only three localities: Huachuca Mts., Palmerlee, and Santa Catalina Mts.

I believe that Schaeffer erred in considering *L. equestris* Lacordaire a subspecies of *L. balteata*, and that Monros (1955:44) is correct that the two are distinct species. The 19 specimens of *L. equestris* Lac. in USNM are from Mexico, Honduras, and Guatemala. I consider this series to represent a species distinct from *L. balteata*, the two species differing chiefly in pronotal and elytral color. In all specimens of *L. equestris* the pronotum is orange to red orange and each elytral apex has a large, oval, yellow spot. In most specimens of *L. balteata* the pronotum is black and the elytral apex is without light markings. The few specimens of *L. balteata* that have an orange pronotum also have light markings at the elytral apex, but the markings are never as large as those found in *L. equestris* and vary from one spot to two spots to a diagonal band.

The species *L. balteata* and *L. solani* are similar in nearly all features except color. They are most readily distinguished by the color of the extreme lateral margins of the elytra: light throughout except apically in *L. solani*; dark basally, light medially, and dark apically in *L. balteata*. The pronotum is nearly always all light in *L. solani* and nearly always all black in *L. balteata*. Few *L. balteata* specimens have a pronotum as shown in figure 19a.; only 3 of the 123 USNM specimens have an entirely light pronotum. Three or four times that number have a pronotum that is partly dark, partly light; the

partly light areas are generally broad and at the apex and base of the pronotum. Two specimens have a pronotum that is nearly uniformly red brown throughout.

In *L. balteata*, orange is often found posteriorly on the abdomen and on the hind coxae. In *L. solani* the base of the abdomen is often partly dark, and the dark color may extend along the side of the abdomen.

Enlargement of the elytral light areas in *L. balteata* (fig. 19a) occurs much more frequently than reduction (fig. 19b). Of the 123 USNM specimens of this species only 2 have the reduction shown in the latter drawing.

One specimen is from "Guadalupe Canyon, Hidalgo Co., New Mexico," but I have not found this canyon on a map of New Mexico. I have, however, found Guadalupe Mountains in the southeast corner of Arizona adjacent to Hidalgo County, New Mexico.

The holotype of *Lema peninsulae* Crotch is in MCZC and bears the type No. 5037, a gray disk, and the information "J.L. LeConte Coll." The type and two USNM specimens that agree well with it bear no elytral light markings and have a totally dark abdomen. All other specimens of *balteata* have at least some light elytral markings, and nearly all specimens have an entirely light abdomen; rarely is the abdomen partly dark. I have found that only three specimens are assignable to *L. peninsulae*, and the feeble differences they exhibit from *L. balteata* indicate that no taxonomic change should be made.

Lema circumvittata
Clark, New Status
(figs. 16, 78, 90)

Lema circumvittata Clark, (in Bates and Clark, 1866:41); Gemminger and Harold, 1874:3251 (world catalog); Austin, 1880:35 (N. Amer. checklist); Henshaw, 1885:105 (N. Amer. checklist); Jacoby and Clavareau, 1904:15 (world catalog); Clavareau, 1913:58 (world catalog); Leng, 1920:287 (N. Amer. checklist); Blatchley, 1924:39 (distribution); Douglass, 1929:4 (distribution).

Lema conjuncta circumvittata Clark: Schaeffer, 1933:300 (taxonomy); Blackwelder, 1939:61 (Amer. checklist); Monros, 1960:213 (world checklist); Wilcox, 1974a:6 (N. Amer. checklist); Wilcox, 1974b:8 (Amer. checklist).

Diagnosis

Elytral disk black throughout, with only lateral margin orange to yellow; basal light marking, if present, covering but 1 interval and extending not over 1/10 length of elytron.

Description

General. Body mostly orange to red orange, but margin of elytra sometimes yellowish. Following black: Antennae (except segment 1), elytra (except outer margin and usually a light spot at base of each elytron), tibiae, and tarsi. Dorsal and ventral body surfaces shiny.

Color Variation. Two specimens have weak dark spots on pronotum; fewer than 1/2 of specimens have light spot at base of elytron; tibial bases sometimes partly light; apex of elytra usually narrowly light, sometimes more broadly light; 1 specimen with leg and elytral dark markings dark brown; in over 1/2 the number of specimens, lateral elytral margin quite noticeably lighter than remaining light parts of body.

Head. An antenna about 1/2 as long as body. Vertex without groove or with a fine, short, longitudinal groove; surface usually with small punctures only at sides. Clypeus with small punctures at sides and larger punctures near middle.

Pronotum. Anterior width subequal to basal width; constriction about median, width at constriction about 78%–85% of width near apex; surface with minute punctures throughout and with moderate- to large-sized punctures located medially in anterior 2/3 and anteriorly on each side; at basal 1/3, an arcuate, transverse depression with a median pit.

Elytra. Punctures of striae generally large, not close; 3d stria with 9–12 punctures in basal 1/2; 9th stria complete; interstriae with generally regular, small punctures and with little to no wrinkling; disk with feeble to no evidence of basal depression.

Ventral Surface. Metasternum with small, often sparse punctures, most dense anteriorly at sides, most sparse posteriorly; surface smooth. Abdomen mostly smooth, sides of segments usually a little irregular, not alutaceous; surface with small and moderate-sized punctures, not dense, and also with moderate-sized punctures most dense near middle of segments.

Length. Body 6.0–7.2 mm.

Aedeagus. In lateral view (fig. 90) widest apically, apical tip nearly straight, upper apical margin weakly concave; in dorsal view sides subparallel, orifice overlaid by a single large lobe; in dorsal view internal processes symmetrical, form not of a human figure.

Type Material

The holotype (in BMNH) bears the data “Type *Lema circumvittata* Clark, Type = *conjuncta* var.; Type; E. Coll. Carry; 756 E. Doubleday. St. John's Bluff E. Florida; *circumvittata* Clark; 67.156.”

Material Examined

Sixty-four specimens were examined, and they were collected in the following locations. **Arizona**—Phoenix. **Florida**—Bradentown; La Belle, Hendry Co.; Duval Co.; St. Johns Co.; Enterprise; S. Daytona; Westgate, Volusia Co.; Sanford; Crescent City; Indian R.; Ormond; L. Okichobee.

Distribution

Lema circumvittata is unique for its apparently widely disjunct distribution (fig. 78). It occurs from mid to north Florida and in Arizona.

Host

The only label datum on host is nightshade.

Remarks

Only 2 of the 64 specimens I examined are from outside of Florida. These two specimens are from Phoenix, Arizona (from CASC) and require that this taxon be treated as a distinct species and not as a subspecies of *L. conjuncta* as it has been to the present time. Without the Arizona record of *L. circumvittata*,

there would be only a narrow overlap of the distributions of *conjuncta* and *circumvittata* in Florida.

Lema conjuncta ranges widely and occurs from South Carolina into Florida and Texas. Of 12 USNM specimens of *conjuncta*, the 4 that have the greatest development of the dorsal dark markings (fig. 17b) and that are thus most similar to certain specimens of *L. circumvittata* (fig. 16a) are all from Texas.

Pattern variation of the dorsum of *L. circumvittata* is slight. About half the number of specimens have a light spot at the elytral base; this spot, however, is never large (fig. 16a). A single specimen in the USNM series of 40 specimens has a weak dark spot on each side of the pronotal disk.

***Lema confusa* Chevrolat**
(figs. 13, 80, 91)

Lema confusa Chevrolat, 1835:116; Lacordaire, 1845:409 (taxonomy); Clark, 1866:31 (world catalog); Gemminger and Harold, 1874:3252 (world catalog); Jacoby, 1888:16; Castle and Laurant, 1896:304 (distribution); Linell, 1897:475 (distribution); Jacoby and Clavareau, 1904:17 (world catalog); Clavareau, 1913:59 (world catalog); Leng and Mutchler, 1914:451 (Amer. checklist); Leng, 1920:287 (N. Amer. checklist); Schaeffer, 1920:321 (taxonomy); Blatchley, 1924:39 (distribution); Brisley, 1928:118 (in key); Schaeffer, 1933:306 (in key); Blackwelder, 1939:61 (N. Amer. checklist); Blackwelder, 1946:629 (Amer. checklist); Pic, 1947:9 (taxonomy); Monros, 1960:207 (world checklist); Moldenke, 1971:108 (habits); Wilcox, 1974a:6 (N. Amer. checklist); Wilcox, 1974b:8 (Amer. checklist).
Lema bivittata Lacordaire, 1845:416; Monros, 1955:44 (taxonomy); Monros, 1960:207 (world catalog).
Lema virgata Lacordaire, 1845:417; Monros, 1960:207 (world catalog).
Lema fasciaticollis Pic, 1941:8; Monros, 1960:207 (world catalog).

Diagnosis

Head and pronotum black. Each elytron with sutural and lateral dark markings (each marking clearly widest medially) and longitudinal, median light stripe. Occurs in southern Florida. (May be difficult to distinguish from certain specimens of *trabeata*.)

Description

General. Body, appendages, and dark markings on elytra dark brown to black, with orange at sides of 5th abdominal segment, light elytral markings orange; often with reddish spots on head above eyes. Dark markings on each elytron as follows: Along suture (often expanded at about apical 1/3, narrowed or absent before apex), a broad spot at apex, a broad band extending from behind humerus to before apex (band widest at about middle of elytron, there covering 4–5 intervals). Dorsal body surfaces shiny; ventral body surfaces more or less shiny.

Head. An antenna nearly 2/3 as long as body; vertex without groove and with fine, moderately dense punctation on anterior; clypeus with moderate to large punctures around margins.

Pronotum. Anterior width subequal to basal width; constriction located at middle, width at constriction about 81%–83% of width at apex; surface with small to moderate-sized punctation located anteriorly along midline to near base and anteriorly on each side; below basal 1/3, transverse depression with a moderate-sized pit.

Elytra. Punctures of striae large to moderate in size, not close; 3d stria with 8–13 punctures in basal 1/2; 9th elytral stria complete (no gap); interstriae with sparse, fine punctation and no wrinkling; disk not or feebly depressed each side before basal 1/3.

Ventral Surface. Metasternum with fine punctation, moderate in density, nearly absent posteriorly at middle; surface smooth, shiny. Abdomen with sparse, generally moderate-sized punctation nearly throughout, most dense at sides; surface smooth, shiny.

Length. Body 5.5–6.0 mm.

Aedeagus. In lateral view (fig. 91) widest apically, apical tip weakly inclined upward, upper apical margin weakly concave; in dorsal view widest apically, orifice overlaid by a moderate-sized lobe; in dorsal view internal processes symmetrical, form of a slender human figure.

Type Material

The Chevrolat types are scattered among various museums including BMNH. However, I did not find the type of *L. confusa* there during a visit in 1977, so I do not know its location. The type locality is given as “Toulepeck,” in Mexico.

Material Examined

I examined only eight specimens. They were collected in the following locations. **Florida**—Biscayne Bay; Dade Co.; Fort Lauderdale; W. Palm Beach; St. Lucie Co.

Distribution

In America north of Mexico, *L. confusa* is known only from southeast Florida (fig. 80).

Hosts

Label data on hosts follow: *Datura stramonium*; *Datura arborea*; on *Datura sauveolens*; at *Physalis*. Moldenke (1971:108) recorded *Datura inozia* Mill. as host.

Remarks

The USNM has specimens of *L. confusa* from Columbia (Bogota), Guatemala (Tiakl, Guatemala City), Belize (La Lima, El Loarque), Costa Rica, and Mexico (Veracruz, St. Lucrecia, and Jalisco, Chapala).

Most specimens of *L. confusa* and the similar species *L. trabeata* are readily distinguished, for the dark elytral markings do not join on the disk in *L. confusa* but do so in nearly all specimens of *L. trabeata*. Just 3 of the 55 USNM specimens of *L. trabeata* have the elytral markings shown in figure 14a. These few specimens are essentially identical with *L. confusa*, and I have

not been able to find characters that will distinguish them from *L. confusa*. All three of these specimens of *L. trabeata* are part of double mounts, the other specimens of the double mounts being typical *L. trabeata* in elytral color pattern. These double-mounted specimens are from Fort Pierce and West Palm Beach, Florida.

The extent of the dark markings of the dorsum (fig. 13) varies but slightly in the few North American specimens examined. There is, however, variation in the tone of these markings. In one specimen the markings are brown rather than black, and those of the elytra are lighter than the pronotum. Color variation is greater among the 28 Central American examples of this species than among North American examples. About half of the Central American specimens have at least some light markings on the pronotum, and more than half have brown (rather than black) markings on the dorsum. The abdomen may be light throughout, and even most of the ventral surface may be light.

Lema omogera Horn (1894:405) has generally been placed as a subspecies of *L. confusa*. Besides consistent and obvious color differences, the distributions and male genitalia indicate that it is a distinct species. (See White 1991:271.)

Lema conjuncta
Lacordaire
(figs. 17, 77, 92)

Lema conjuncta Lacordaire, 1845:408; Clark, 1866:31 (world catalog); Crotch, 1873a:25 (taxonomy); Crotch, 1873b:94 (N. Amer. checklist); Gemminger and Harold, 1874:3252 (world catalog); Schwarz, 1878:458 (distribution); Henshaw, 1885:105 (N. Amer. checklist); Castle and Laurant, 1896:304 (distribution); Hamilton, 1895b:318 (distribution); Jacoby and Clavareau, 1904:15 (world catalog); Clavareau, 1913:59 (world catalog); Dozier, 1918:370 (distribution); Leng, 1920:287 (N. Amer. checklist); Britton, 1920:273 (distribution); Blatchley, 1924:39 (distribution, habits); Schaeffer, 1933:306 (in key); Blackwelder, 1939:61 (N. Amer. checklist); Löding, 1945:126 (distribution, habits); Fattig, 1948:5 (distribution); Monros, 1960:213 (world checklist); Balsbaugh and Hays, 1972:20 (taxonomy, habits); Wilcox, 1974a:6 (N. Amer. checklist); Wilcox, 1974b:8 (Amer. checklist).

Diagnosis

Each elytron mostly black with narrow lateral margin orange to yellow, also with basal light marking covering 3 intervals and extending 1/8 to nearly 1/2 length of elytron.

Description

General. Body mostly orange to red orange. Following are black: antennae (except 1st segment), elytra (except for lateral margin, apex, and partial stripe that is at base between humerus and suture and that extends 1/4 to nearly 1/2 length of elytron), tibiae (except base), tarsi. Dorsal and ventral body surfaces shiny.

Color Variation. Pronotum sometimes (4 of 20 specimens) with 2 black spots; light markings both at elytral apex (1/20 to 1/8 length of elytra) and at base of tibiae (1/6 to 1/2 length of tibia); in some specimens elytral light markings approach yellow; 1 specimen with dark brown elytral markings.

Head. An antenna about 1/2 as long as body. Vertex either not grooved or with a fine longitudinal groove; surface usually with small punctures only at sides but sometimes also with moderate-sized punctures near middle.

Pronotum. Anterior width subequal to, to less than basal width; constriction located at about middle, width at constriction about 80%–83% of width near apex; surface with minute punctures throughout but also with moderate-sized punctures located medially in anterior 2/3 and anteriorly each side; at basal 1/3, an arcuate, transverse depression with a median pit.

Elytra. Striae consisting of generally large, variable-sized punctures; 3d stria with 10–15 punctures in basal 1/2; 9th stria complete; interstriae with generally regular, small punctures and little to no wrinkling; disk with feeble to no evidence of basal depression.

Ventral Surface. Metasternum with small, generally sparse punctures, most dense anteriorly at sides, most sparse posteriorly near middle; surface smooth, sometimes a little irregular at sides. Abdomen mostly smooth, but sides of segments usually a little irregular, not alutaceous; punctures small and moderate-sized, generally sparse, but most dense near middle of segments.

Length. Body 5.8–7.4 mm.

Aedeagus. In lateral view (fig. 92) widest apically, apical tip weakly inclined upward, upper apical margin nearly straight; in dorsal view widest medially, orifice overlaid by a medium-sized lobe; internal processes symmetrical in dorsal view, form of a slender, weakly humanlike figure.

Type Material

The holotype (in BMNH) bears the data “Type; *Lema conjuncta* var A Lacord. Type; E. Coll. Laferte; Ex Mus. Dejean; *Lema conjuncta* Dej. 1 . . . in Amer. bor.? D. Leconte; 67.56.” In the original description the locality of collection is given as “Des États-Unis.”

Material Examined

I examined only 20 examples of this species. They were collected in the following localities. **Florida**—Gainesville; Tampa; Citra. **S. Carolina**—Parris Isl., Beaufort Co. **Texas**—Bostrop; Karnack ?, (this sp.?).

Distribution

Lema conjuncta occurs from South Carolina to Florida to Texas (fig. 77).

Hosts

Blatchley (1924:39) swept *L. conjuncta* from oak; Löding (1945:126) collected it from buckeye; Balsbaugh and Hays (1972:20) recorded it as present on *Aesculus* sp.

Remarks

The name *L. conjuncta* Lac. was first published in the Dejean catalogs (Dejean 1835:359, 1837b:386) but was a nomen nudum in both publications.

For further discussion of this species see under *Lema circumvittata*.

Lema maderensis
White, New Species
(figs. 11, 83)

Diagnosis

Elytra mostly light with 3 longitudinal black stripes; pronotum light with black stripe on each side extending from anterior to base.

Description

General. Background yellow to yellow orange. Following are black: Head; antenna (except part of basal segment); elongated spot on each side of pronotum; scutellum; scutellar interval of elytra; part of 1st interval; longitudinal stripe extending from humerus to near apex of elytron and spanning 6th to 9th intervals at base and 7th to 9th intervals near apex; part to most of prosternum, mesosternum, and metasternum; abdomen (except apex); all coxae; about apical 1/2 of femora; outer, apical portions of tibiae, tarsi. Dorsal and ventral body surfaces predominantly shiny.

Color variation. Mandibles may bear yellow medially; about 1/2 to a small portion of basal antennal segment yellow or light; yellow may nearly extend to apex on profemur, or may form a spot each side on metafemur.

Head. An antenna a little less than 1/2 as long as body; vertex with a pit or groove and with dense, moderate-sized to large punctation; clypeus with scattered, moderate-sized to large punctation.

Pronotum. Anterior width subequal to basal width, width a little greater than length; constriction submedian, width at constriction about 81%–83% of width near apex; surface more or less smooth but with large punctation located medially in anterior 2/3 and apically on each side; at basal 1/3 transverse depression with a moderate-sized median pit.

Elytra. Punctures of striae moderate in closeness; 3d stria with 11–15 punctures in basal 1/2; 9th stria complete; interstriae with small punctures and weak to no wrinkling; disk with feeble to no indication of basal depression.

Ventral Surface. Metasternum with small to moderate-sized punctation, moderate in density; punctation nearly absent medially; surface generally smooth, shiny. Abdomen with moderate-sized punctation, moderate in density over most of surface; side surface wrinkled or irregular.

Length. Body 4.6–5.8 mm.

Type Material

The male holotype (FSCA) and two paratypes (one FSCA, one USNM) of *L. maderensis* bear the label data "Arizona, Santa Rita Mts., Madera Cyn., 26 Aug., 1970, K. Stephan coll." Four paratypes (three FSCA, one USNM) bear "Arizona: Santa Rita Mts., Madera Cyn., Aug. 18, 1968." I examined seven type specimens.

Distribution

Lema maderensis is known only from southeastern Arizona (fig. 83).

Remarks

The genitalia of the male holotype are not illustrated because of dermestid damage to it. Another male shows a nearly total loss of abdominal parts due to dermestid damage.

An attempt to establish whether or not *L. maderensis* has been previously described from Mexico was undertaken, but it was no easy task; over 80 species of *Lema* have been described from Mexico. I examined the descriptions of nearly all these species and found none that seemed to apply to *L. maderensis*. Illustrations of *Lema* species in "Biologia Centrali Americana" were also examined, and with negative results. *Lema maderensis* is most similar to *L. nigrovittata* Guér. The two species are readily separated because the lateral elytral stripes of *L. maderensis* are broad and on the sixth or seventh to ninth intervals whereas those of *L. nigrovittata* are narrow and on the fifth or sixth to seventh intervals. There is no appreciable reduction of these elytral stripes among the specimens of *L. maderensis*, but there is reduction among the 60 North American specimens of *L. nigrovittata* in USNM: 10 have discontinuous lateral stripes, and 3 have no stripes, only humeral spots (fig. 12a). In a very few specimens of *L. nigrovittata*, the lateral pronotal spots approach the size of the elongated spots that are typical for specimens of *L. maderensis*.

Lema melanofrons
White, New Species
(figs. 6, 79, 94)

Diagnosis

Ninth elytral stria with no gap; elytra mostly light and with 3 more or less complete, narrow, black stripes, or with lateral markings reduced to absent and with only a remnant of median stripe; head with black band between eyes.

Description

General. Predominantly yellow to yellow orange. Following are black: broad band between eyes, a spot on each side of pronotum, scutellum, part to nearly all of suture, sides of metasternum. Following may be black: clypeus, antennae (basal segment mostly brown), base of head, humeri, median portion of 9th interval, most of metasternum, part of abdomen, apices of tibiae and tarsi. Dorsal body surfaces shiny; ventral body surfaces more or less shiny.

Color Variation. Tarsi usually black but may be brown nearly throughout; black may predominate on metasternum with yellow present only anteriorly on each side; abdomen yellow throughout, with black at sides and middle, or abdomen predominantly black, with yellow only apically and basally; coxae may be black in part.

Head. An antenna about 1/2 as long as body; vertex sometimes with a weak median carina and with moderate-sized, dense punctation; clypeus with moderate-sized and large punctation.

Pronotum. Anterior width subequal to basal width, width a little greater than length; constriction median, width at constriction about 83%–88% of apical width; surface smooth but with moderate-sized to large punctures located medially in anterior 2/3 and apically on each side; at basal 1/3, a transverse depression with a moderate-sized median pit.

Elytra. Punctures of striae not close; 3d stria with 11–14 punctures in basal 1/2; 9th stria complete; interstriae with small punctures and feeble to no wrinkling; disk with no indication of basal depression.

Ventral Surface. Metasternum with small punctures, moderate in density at sides, sparser toward middle, nearly absent at middle. Abdomen with small to moderate-sized punctures, most dense at sides, sparser medially, surfaces often a little irregular at sides.

Length. Body 5.2–7.6 mm.

Aedeagus. In lateral view (fig. 94) widest apically, apical tip weakly inclined upward, upper apical margin weakly concave; in dorsal view widest apically, sides weakly sinuate, orifice overlaid by a single, medium-sized lobe; internal processes in dorsal view symmetrical, form clearly of a human figure.

Type Material

The male holotype (USNM) has the label information “Solanum, Dare Co., N.C. 4–XI–43–1946; *Lema* sp., perhaps new. near *trilineata* (Ol.), H.S.B. 43.” One paratype has “F Sherman Collector; Beaufort, N.C. [undecipherable] 1909; 34.” Two paratypes have “Bodie I., 17–8–39, N.C., C.S. Brimley,” one of these paratypes has “31,” the other “32.” One paratype has “D.J. Mobile, V. Alab.; ex. coll. Chas. Schaeffer, 1935 Barber; *medionota* #3, Schaeff. 33, PARATYPE USNM; H.S. Barber Bequest, 1950.” Three paratypes have “N. Carolina, Dare Co., Pea Island, Natl. Wildlife Ref.; 14–VI–1974, Nolan H. Newton; On *Physalis viscosa* ssp. *maritima*.” (All eight types in USNM.)

Four paratypes (three in CNCI, one in USNM) have the label information “Oregon Inlet, Outer Banks, N.C., VIII.10.1961, H.F. Howden.” One final paratype (OSUC) has “Wilmington, N.C., H.W. Wenzel Collection.”

Material Examined

The number of specimens examined is 13. These were collected in the following locations. **Alabama**—Mobile. **North Carolina**—Dare Co., Pea Isl.; Beaufort; Bodie Isl.; Oregon Inlet, Outer Banks; Wilmington.

Distribution

Lema melanofrons is known only from coastal areas of North Carolina and Alabama (fig. 79).

Host

The following narrative is from personal notes of Bryan Farrell: “Adults, eggs, larvae collected on defoliated host plant *Physalis viscosum* var. *maritima* on May 4, 1986 at Ocracoke Island, North Carolina. The yellow eggs were found in groups of about 25 on the undersides of terminal leaves. The plants were growing on back of dunes in full sun. Mature larvae were brought to College Park on May 5; they immediately entered the sand for pupation. The bright yellow, unadorned pupae (no pupal case) were found 5–7 cm deep. Adults emerged in 25 days on May 30.”

Remarks

One of the specimens (from Mobile, Alabama) is a paratype from the series of *Lema trilineata medionota* Schaeffer.

Superficially, *L. melanofrons* looks markedly similar to *L. pubipes* Clark. These two species can be distinguished by distributions and color characters. Their distributions are mutually exclusive (*L. melanofrons*, coast of North Carolina and coast of Alabama; *L. pubipes*, Southwestern United States). *Lema melanofrons* has a black band between the eyes and two spots on the pronotal disk. *Lema pubipes* usually has a light-colored head and may have, instead of a black band, three discrete black markings between the eyes—one spot on the vertex and a black marking adjacent to each eye. The pronotum bears a pair of spots in fewer than a third of the specimens.

Lema nigrovittata (Guérin) (figs. 12, 71, 95)

Crioceris nigrovittata Guérin, 1844:262.

Lema nigrovittata (Guérin): Lacordaire, 1845:421 (taxonomy); Clark, 1866:31 (world catalog); Gemminger and Harold, 1874:3257 (world catalog); Crotch, 1873a:26 (taxonomy); Crotch, 1873b:94 (N. Amer. checklist); Henshaw, 1885:105 (N. Amer. checklist); Jacoby, 1888:17 (taxonomy); Gahan, 1891:372 (mimicry); Riley, 1893:242 (distribution); Wickham, 1896b:165 (distribution); Fall, 1901:152 (distribution, biology); Snow, 1903:198 (distribution); Jacoby and Clavareau, 1904:15 (world catalog); Snow, 1904:332 (distribution); Snow, 1906:170 (distribution); Cockerell and Fall, 1907:194 (distribution); Clavareau, 1913:72 (world catalog); Leng, 1920:287 (N. Amer. checklist); Leonard, 1928:462 (distribution, record probably in error); Fall, 1928:238 (taxonomy); Douglass, 1929:4 (distribution); Schaeffer, 1933:300 (taxonomy); Krauss, 1934:389 (distribution); Tanner, 1934:48 (distribution); Krauss, 1935:13 (distribution); Schmidt, 1935:23 (distribution, habits); Swezey, 1935:21 (distribution, habits); Ehrhorn, 1936:140 (distribution); Schmidt, 1937:364 (distribution, habits); Illingworth, 1938:11 (distribution, habits); Swezey and Wakabayashi, 1938:13 (distribution, habits); Van Zwaluwenberg, 1938:9 (distribution, habits); Williams, 1938:9 (habits); Blackwelder, 1939:61 (N. Amer. checklist); Blackwelder, 1946:630 (Amer. checklist); Pallister, 1953:8 (distribution, likely in error); Terrazas, 1958:124 (biological control); Sengupta, 1957:472 (distribution, habits); Monros, 1960:208 (world checklist); Wilcox, 1974a:6 (N. Amer. checklist); Wilcox, 1974b:8 (Amer. checklist).

Lema notativentris Schaeffer, 1920:322; Fall, 1928:238 (taxonomy); Schaeffer, 1933:300 (taxonomy); Leng, 1927:44 (N. Amer. checklist); Brisley, 1928:118 (taxonomy); Monros, 1960:208 (world checklist).

Diagnosis

Elytra mostly light and with 3 dark stripes; each lateral stripe spans no more than 2 intervals (6th and 7th) and extends from humerus to nearly the apex, or striae may be reduced to a humeral spot; pronotal dark markings, if present, consist of 1 spot on each side; 9th elytral stria with no gap.

Description

General. Predominantly yellow to yellow orange. Following are generally black (see variation, below): Head, antenna (except basal segment), a spot on each side of pronotum, elytron scutellar interval, lateral elytral stripe on 6th and 7th intervals and extending from humerus to nearly apex, all coxae,

prosternum adjacent to coxae, all of mesosternum and metasternum, an elongated spot on femoral apices, outer margin of tibiae, tarsi. Dorsal and ventral body surfaces predominantly shiny.

Color Variation. Basal antennal segment may be partly or entirely black; antennal segments 2 and 3 may be yellowish to brown in part; infrequently entire antenna brown; infrequently pronotal spots much reduced or absent; lateral elytral stripe rarely expanded to 5th interval, more frequently reduced, sometimes nearly absent, sometimes reduced to elongated spot on only humerus; spot on metafemora may be absent; abdomen may be yellow, or (most often) yellow with black medially on most segments, or black nearly throughout.

Head. An antenna about 1/2 as long as body; vertex with a narrow, longitudinal groove and with moderate-sized to large, moderately dense punctation adjacent to sutures; clypeus with scattered large to moderate-sized punctation.

Pronotum. Anterior width a little greater than basal width, width a little greater than length; constriction submedian, width at constriction 81%–85% of width near apex; surface smooth, with large punctation located medially in anterior 2/3 and apically on each side; at basal 1/3, a transverse groove or shallow transverse depression with a moderate-sized pit.

Elytra. Punctures of striae not close, 3d stria with 10–13 punctures in basal 1/2; 9th stria complete; interstriae with small punctures and feeble to no wrinkling; disk with feeble to no indication of basal depression.

Ventral Surface. Metasternum with only small punctures of moderate density on sides. Abdomen with sparse, small punctures; side surface more or less finely wrinkled.

Length. Body 5.0–6.7 mm.

Aedeagus. In lateral view (fig. 95) widest apically, apical tip clearly inclined upward, upper apical margin weakly concave; in dorsal view widest apically, sides weakly sinuate, orifice overlaid with a single small lobe; internal processes in dorsal view symmetrical, in form of a human figure.

Type Material

The location of the holotype of *L. nigrovittata* is not known. In the original description of the species, the locality of collection is given as “Hab. la California e le Mexique.”

Material Examined

I examined 80 specimens from the United States. The locations of collection follow. **Arizona**—Huachuca Mts.; Douglas; Hereford; Portal; Patagonia; Showlow; Pima Co.; Santa Cruz Co., Madera Canyon; Cochise Co., Wilcox Playa. **Colorado**—Delta Co. **New Mexico**—Koehler; Santa Fe; Jemez Springs; Silver City; Jemez Mts. **Texas**—Jeff Davis Co.

Distribution

The distribution of *L. nigrovittata* is roughly triangular, the points of the triangle being in western Texas, western Colorado, and eastern Arizona (fig. 71).

Hosts

Biological data from specimen labels include the following: on *Physalis*; on *Datura*. Literature notes follow: damaging potha (Schmidt 1937:364); on eggplant and angel's trumpet (Swezey 1938:13); potato and belladonna (Van Zwaluwenburg 1938:9); depredates *Datura metalloides* (Fall 1901:152); ovi-posit on *Datura metel* and *D. tatula* (Williams 1938:9).

Remarks

The specimens with the least development of dark pronotal and elytral markings are from Delta Co., Colorado. In a series of six specimens (in USNM) from Delta Co. these markings are reduced to much reduced.

In addition to the 80 North American specimens, I examined 124 specimens of this species from Mexico; most are in USNM.

For notes on the distinctions between this species and the one that is most similar to it, see under *L. maderensis*.

Lema nigrovittata was accidentally introduced into Hawaii (Krauss 1934:389) and is somewhat of a pest there. The references in the synonymy by Krauss, Schmidt, Ehrhorn, Swezey, Illingworth, Van Zwaluwenburg, and Sengupta refer to the distribution and habits in Hawaii.

***Lema opulenta*
Gemminger & Harold
(figs. 15, 83, 96)**

Lema ornata Baly, 1865:158 (preoccupied, *ornata* Gravenhorst, 1807); Gemminger and Harold, 1874:3258 (world catalog); Schaeffer, 1920:321 (taxonomy); Leng, 1927:44 (N. Amer. checklist); Blackwelder, 1946:631 (world checklist).

Lema opulenta Gemminger and Harold, 1874:3258 (replacement name); Jacoby, 1888:17 (taxonomy); Jacoby and Clavareau, 1904:21 (world catalog); Clavareau, 1913:72 (world catalog); Schaeffer, 1920:321 (taxonomy); Leng, 1920:287 (N. Amer. checklist); Leng, 1927:44 (N. Amer. checklist); Schaeffer, 1933:307 (taxonomy); Blackwelder, 1946:631 (Amer. checklist); Monros, 1960:207 (world checklist); Wilcox, 1974a:6 (N. Amer. checklist); Wilcox, 1974b:8 (Amer. checklist).

Lema lebioides Linell, 1897:474; Jacoby and Clavareau, 1904:15 (world catalog); Leng, 1920:287 (N. Amer. checklist); Schaeffer, 1920:321 (taxonomy); Leng, 1927:44 (N. Amer. checklist); Moreno and Bibby, 1943a:25 (biology); Moreno and Bibby, 1943b:62 (biology); Monros, 1960:207 (world checklist).

Diagnosis

Pronotum with a vague dark pattern on a light background, pattern may be at sides only; elytra dark with arching basal light marking or light transverse band; legs light throughout.

Description

General. Legs, abdomen, and elytral pattern yellow to dull orange; antennae light brown. Head partly light brown, partly dark brown; usually most of base and labrum dark brown; usually clypeal area, front, and base of vertex light brown. Pronotum light brown and usually with only constriction dark brown. Elytra yellow to dull orange and following dark brown: Basal spot (usually longer than wide), a roughly triangular area on each elytron (from humerus back toward elytral apex), a spot at apex. Mesosternum usually dark throughout; metasternum usually dark at sides, remainder light except for dark at middle apically. Surfaces shiny throughout.

Color variation. Head and pronotum may be reddish in part to reddish throughout; dark markings of pronotum (when present) sometimes predominating on disk and base; sometimes dark humeral patch broken medially; rarely basal 1/4 of elytra entirely dark except for epipleuron; dark humeral patches may be present apically at suture.

Head. An antenna 1/2 to a little more than 1/2 length of body; vertex with a median, elongated fovea and fine punctation; clypeus with fine and coarse punctation.

Pronotum. Slightly wider than long, basal width slightly greater than apical width; constriction median, width at constriction 79%–81% of width at base; punctation of moderate size located medially in apical 1/2 and apically on each side; at basal 1/3, a shallow transverse depression with a median pit.

Elytra. Punctures of striae not close, 3d stria with 9–11 punctures in basal 1/2; disk with a weak to obsolete transverse depression at basal 1/4; interstriae with moderately distinct to obsolete fine punctation.

Ventral Surface. Metasternum smooth nearly throughout; surface with fine, mostly sparse punctures, least dense medially, densest at sides. Abdomen smooth, with sparse, fine and moderate-sized punctation.

Length. Body 4.0–6.0 mm.

Aedeagus. In lateral view (fig. 96) widest apically, apical tip inclined upward, upper apical margin weakly concave; in dorsal view sides subparallel, orifice overlaid with a moderate-sized, single lobe; internal processes in dorsal view symmetrical, in form of a slender human figure.

Type Material

The holotype (BMNH) of *L. opulenta* bears the data “Type; *Lema opulenta* Harold = *ornata* Baly Type; ?; 55 24; *Lema ornata* Baly Guatemala; Baly Coll.”

Material Examined

I examined 267 specimens collected in the following locations. **Texas**—Brownsville; Cameron Co.; San Benito; Donna; Pharr; San Antonio; Mercedes; Victoria; Rockport; McAllen; Hidalgo Co.; Bentsen; R. Grande St. Pk.; Pt. Isabel.

Distribution

Lema opulenta occurs just in southern Texas (fig. 83).

Hosts

Label data are as follows: On Irish potato; on lettuce; from cotton; on corn leaves; on *Solanum triquetrum*; on squash foliage. A literature note is as follows: *Gossypium hirsutum* (Moreno and Bibby 1943a:25; 1943b:6).

Remarks

More than 20 USNM specimens from Victoria, Texas, exhibit the variation in elytral color pattern shown in figure 15c. Other specimens examined have a color pattern intermediate between that in figure 15c and the one typical for *L. opulenta*. The male genitalia of the Victoria specimens are like those of all the other *L. opulenta* examined. I found no characters that will serve to distinguish these differing individuals from typical *L. opulenta*, so I regard this series as representing just a color form of *L. opulenta*.

Clearly the three species *L. opulenta*, *L. confusa*, and *L. trabeata* are closely related. *Lema opulenta* is the most readily distinguished of these; the pronotum is generally bicolored (but varies to light throughout) and the elytral suture is generally light at least medially. Both *L. confusa* and *L. trabeata* have a black pronotum and an elytral suture that is dark throughout, although sometimes light apically. Also, the dark markings of *L. opulenta* are generally brown while those of *L. confusa* and *L. trabeata* are black. Finally, the legs and much of the ventral surface of *L. opulenta* are light while the legs and much of the ventral surface of *L. confusa* and *L. trabeata* are black.

***Lema pubipes* Clark**
(figs. 10, 80, 97)

Lema pubipes Clark, 1866:52 (in Bates and Clark); Clark, 1866:33 (world catalog); Gemminger and Harold, 1874:3259 (world catalog); Austin, 1880:35 (N. Amer. checklist); Henshaw, 1885:105 (N. Amer. checklist); Jacoby and Clavareau, 1904:15 (world catalog); Clavareau, 1913:83 (world catalog); Leng, 1920:287 (N. Amer. checklist); Monros, 1960:222 (world catalog); Wilcox, 1974a:7 (N. Amer. checklist); Wilcox, 1974b:8 (Amer. checklist).

Diagnosis

Ninth elytral stria with no gap; elytra mostly light and with 3 more or less complete, narrow black stripes (1 sutural, 2 lateral), lateral markings may be absent; head lacking a black band between eyes.

Description

General. Predominantly yellow to yellow orange. Following are black: Humeral spot, most of antennae (1st segment light and 2d segment may be light), elytral suture. Following are nearly always black: Vitta on 9th interval behind humerus, sides of metasternum, most of tarsi. Following are sometimes black: Spot on vertex (between eyes); 2 spots on pronotum; scutellum; apices of tibiae; rarely, apex of hind femur. Dorsal body surfaces shiny; ventral body surfaces more or less shiny.

Color Variation. In lightest specimens many antennal segments light in part; sutural stripe sometimes complete, usually not reaching apex, sometimes less than 1/2 length of elytra; 1 specimen with lateral vitta nearly 2 intervals wide.

Head. An antenna about 1/2 as long as body. Vertex sometimes with a fine, longitudinal groove, sometimes with a broad pit; punctures moderate sized, more or less dense on each side. Clypeus with scattered large to moderate-sized punctures.

Pronotum. Anterior width subequal to basal width, width a little greater than length; constriction submedian, width at constriction about 77%–80% of width near apex; surface smooth but with moderate-sized to large punctures located medially in anterior 2/3 and apically on each side; slightly above basal 1/3, a transverse depression sometimes with median pit.

Elytra. Punctures of striae moderately close, 3d stria with 11–15 punctures in basal 1/2; 9th stria complete; interstriae with fine punctures and no to feeble wrinkling; disk with no indication of basal depression.

Ventral Surface. Metasternum smooth nearly throughout, with small punctures, at sides moderate in density, at middle sparse; abdomen mostly smooth, with fine punctures, dense at sides, sparse medially.

Length. Body 5.8–7.7 mm.

Aedeagus. In lateral view (fig. 97) widest apically, apical tip clearly inclined upward, upper apical margin weakly concave; in dorsal view widest medially, sides weakly sinuate, orifice overlaid by a small, single lobe; internal processes symmetrical in dorsal view, clearly in form of a human figure.

Type Material

The type of *L. pubipes* is in BMNH and bears the data “Type; *pubipes* Clark; TYPE; *Lema pubipes* Clark; *Lema Pallidula* Pilate Texas, *Lema pubipes* Clark.” The color pattern of specimens here identified as *L. pubipes* agrees well with that of the type.

Material Examined

I examined a total of 63 specimens collected in the following locations. **Alabama**—Dauphin Isl. **Arizona**—Pima Co.; Santa Rita Mts. **Arkansas**—Fayetteville. **Colorado**—Loveland; Berkeley; Denver; Pawnee Natl. Grassland. **Mississippi**—Horn Isl.; Columbia. **New Mexico**—Socorro Co.; Santa Fe; Torrance Co.; Pinedale; Catron Co.; Albuquerque. **Texas**—Galveston; Kenedy Co. **Utah**—Zion Co; Bellevue. **Wyoming**—Dwyer; Wheatland; Platte Co.

Distribution

Lema pubipes occurs in South Central United States from Alabama to Arizona and up to Colorado (fig. 80).

Hosts

Label data follow: On cucumber; on pigweed.

Remarks

For a discussion of the differences between *L. pubipes* and its nearest relative, *L. melanofrons*, see under the latter.

In several of the specimens of *L. pubipes* that I have examined, the elytral lateral stripe is continuous with the humeral spot. However, in most specimens a distinct gap separates these markings. About 10 of the 63 specimens examined have no lateral elytral stripe (fig. 10a).

In addition to being closely related to *L. melanofrons*, *L. pubipes* is similar to *L. trivittata*. In the last species, the lateral elytral stripe is long and covers at least two elytral intervals. At maximum development, the lateral elytral stripe on *L. pubipes* is short and covers 1 1/2 to nearly 2 intervals.

Insofar as the literature indicates, this species had evidently not been recognized since its description. This deficiency is surprising, for *L. pubipes* is clearly a valid species, and the original description was thorough enough as to allow it to be recognized. Nonrecognition by taxonomists of this species for over 120 years can only be regarded as a gross oversight.

Clark's description of the elytral color includes mention of a black humeral spot and narrowly black suture, but no mention is made of the black lateral stripe on each elytron. This stripe does not occur in 9 of the 63 specimens.

Lema puncticollis (Curtis) (figs. 3, 75, 93)

Crioceris puncticollis Curtis, 1830:plate 323.

Chrysomela cyanella Linnaeus, 1760:376.

Lema puncticollis (Curtis), Baly, 1873:74; Jacoby and Clavareau, 1904:6; Clavareau, 1913:60.

Lema cyanella (L.), Gemminger and Harold, 1874:3252 (world catalog); Jacoby and Clavareau, 1904:5 (world catalog); Clavareau, 1913:60 (world catalog); Sengupta, 1957:472 (distribution); Monros, 1960:181 (world catalog); Selman and Smith, 1968:73 (taxonomy); Slobodyanyuk, 1976:1849 (beneficial habits); Peschken and Johnson, 1979:1059 (biocontrol agent of thistle); Batra et al., 1981:36 (host thistle); Peschken, 1984a:142 (ecology, host specificity, fieldcage release); Peschken, 1984b:1377 (hosts, biocontrol agent).

Lema rugicollis Suffrian, 1841d:97; Clavareau, 1913:61 (world catalog);

Monros, 1960:182 (world catalog).

Lema obscurior Pic, 1897:3.

Diagnosis

Pronotal constriction deep and nearly median; eyes deeply, acutely notched; entire body black.

Description

The description given below is based on five European specimens of *L. puncticollis* taken in Spain, Switzerland, and Russia. I did not examine any of the specimens brought into Canada.

General. Body and appendages black throughout; most surfaces with a distinct bluish reflection; antennae with no bluish reflection; tibiae and tarsi with little to no bluish reflection. Dorsal body surfaces shiny; ventral body surfaces shiny to moderately shiny.

Color Variation. Pronotum sometimes with a weak greenish reflection; parts of ventral surface sometimes with weak or no blue reflection.

Head. An antenna a little over 1/2 as long as body; vertex with a short, deep, longitudinal groove near middle, sometimes pitlike, also with large, coarse punctation, moderate in density, also with small punctures and wrinkling near middle; clypeus with large, coarse punctures most dense basally, also with small punctures.

Pronotum. Anterior width a little less than basal width; constriction located a little below middle, width at constriction about 82%–85% of width near apex; surface with large, moderate, and small punctation nearly throughout, large punctures running together near middle of disk and moderate to dense in density, somewhat irregular in distribution; moderate-sized punctures irregular in distribution, small punctures moderate in density; at about basal 1/4, weak transverse depression with a distinct pit.

Elytra. Punctures of striae large, not close; 3d stria with 11–15 punctures in basal 1/2; 9th elytral stria complete; surface more or less wrinkled, with minute punctation; disk at basal 1/4 with a shallow depression.

Ventral Surface. Metasternum with small to moderate-sized punctation, dense at sides, sparse at middle; surface usually smooth, sometimes finely wrinkled at middle. Abdomen with fine to moderate-sized punctation, generally moderate in density, most sparse on 1st segment, sides of segments not alutaceous.

Length. Body 4.3–5.2 mm.

Aedeagus. In lateral view (fig. 93) widest medially, apical tip inclined downward, upper apical margin clearly convex; in dorsal view apex broad, orifice small, with just 2 weak lateral lobes; internal processes in dorsal view asymmetrical.

Type Material

The John Curtis collection is in the Museum of Victoria, Victoria, Australia. Ken Walker informed me that the museum has a syntypic series of four unlabeled specimens of *Crioceris puncticollis* and has sent one to me. The specimen is hereby designated (and labeled) as lectotype of *L. puncticollis*.

Distribution

This European species was released in Saskatchewan and New Brunswick, Canada (fig. 75); it evidently did not survive.

Hosts

Recorded hosts of *L. puncticollis* are *Cirsium arvense* and *C. drummondii*.

Remarks

In much of the European literature *L. puncticollis* is known as *Lema cyanella* (L.) Peschken and Johnson (1979:1067) stated “*L. cyanella* is a promising candidate for the biological control of Canada thistle because both larvae and adults feed voraciously on leaves of this weed; its wide distribution in Eurasia indicates that it will easily establish in North America; it has a limited host range and its main host is *C. arvense*. It is recommended that *L. cyanella*, free from its parasites and disease, should be released in North America for the biological control of Canada thistle.”

Canada thistle is an injurious weed in agricultural areas of Canada and Northern United States. Estimates of damage in the Prairie Provinces of Manitoba, Alberta, and Saskatchewan place the loss in yield of wheat alone at \$23 million annually (Peschken and Johnson 1979:1059). Frequent cultivation during the growing season, the application of herbicides, and the planting of competitive crops (such as alfalfa) reduce Canada thistle to very low levels; but fields are constantly reinfested from fencerows, slough margins, and headlands.

Diether Peschken (personal correspondence) stated that *L. cyanella* was released in field cages at Indian Head, Saskatchewan, and Sussex, New Brunswick, in 1983. Forty-eight adults, and 752 eggs and larvae were released in Saskatchewan, and 422 adults were released in New Brunswick. No recoveries from any of these releases have been made. At New Brunswick, 55 adults escaped from cages when cows ripped them open.

The following is from Selman and Smith (1968:73): “There is confusion over the identity of *Chrysomela cyanella* Linnaeus, 1758. The specimen now in the Linnaean collection with the name *Chrysomela cyanella* is of the species also known as *Lema lichenis* Voet 1806, the type-species of the genus *Hapsidolema* Heinze, 1927, a junior synonym of the genus *Oulema* Des Gozis, 1886. *Oulema* Des Gozis and *Lema* are distinct genera. However, most workers have understood the name *Chrysomela cyanella* Linnaeus 1758 to apply to the species also known as *Lema puncticollis* Curtis 1830.”

***Lema solani* Fabricius**
(figs. 18, 75, 98)

Lema solani Fabricius, 1798:93; Dejean, 1821:115 (world checklist); Dejean, 1835:360 (world checklist); Dejean, 1837b:386 (world checklist); Lacordaire, 1845:126 (taxonomy); LeConte, 1849:34 (distribution); Clark, 1866:30 (world catalog); Crotch, 1873b:94 (N. Amer. checklist); Crotch, 1873a:25 (in key); Gemminger and Harold, 1874:3261 (world catalog); Schwarz, 1878:458 (distribution); Henshaw, 1885:105 (N. Amer. checklist); Castle and Laurant, 1896:304 (distribution); Smith, 1900:299 (distribution); Jacoby and Clavareau, 1904:15 (world catalog); Smith, 1910:338 (distribution); Leng, 1911:210 (distribution, host); Leng, 1912:298 (distribution); Clavareau, 1913:79 (world catalog); Dozier, 1918:370 (distribution); Leng, 1920:287 (N. Amer. checklist); Blatchley, 1924:39 (distribution, host); Schaeffer, 1933:306 (in key); Brimley, 1938:221 (distribution, host); Blackwelder, 1939:61 (N. Amer. checklist); Löding, 1945:126 (distribution); Fattig, 1948:5 (distribution); Monros, 1960:209 (world checklist); Balsbaugh and Hays, 1972:19 (taxonomy); Wilcox, 1974a:7 (N. Amer. checklist); Wilcox, 1974b:9 (Amer. checklist).

Diagnosis

Elytra mostly black with a transverse light band that may be expanded to base; lateral elytral margin light throughout except at apex.

Description

General. Head, antennae, legs, sides of prosternum, mesosternum, metasternum, and most of elytra black; abdomen sometimes partly black; dark parts of elytra often with bluish to purplish reflection; pronotum, transverse band of elytra and lateral margin of elytra and abdomen yellow to orange (last may be black in part). Body shiny throughout.

Color Variation. Head often orange at extreme base; pronotum rarely with an elongated discal dark spot; light elytral band sometimes narrowed, sometimes broadened, varying from about 1/8 to 1/4 elytral length; rarely with light spots at elytral apex; 1 specimen with band (1 elytron only) extending to base; prosternum sometimes entirely black; abdomen sometimes partly to largely brown to black.

Head. An antenna a little less than 1/2 to clearly 1/2 length of body; above vertex usually with a median, elongated fovea or groove and with fine punctation, irregular in size; clypeus with punctures moderate in density, smaller punctures around sides and larger punctures near middle.

Pronotum. Anterior width subequal to basal width; constriction median, width at constriction about 83%–90% of width near apex; surface with very fine, sparse punctation and with moderate-sized punctation located medially in anterior 2/3 and anteriorly on each side; at basal 1/3, transverse depression with a shallow median pit.

Elytra. Punctures of striae not close, 3d stria with 9–11 punctures in basal 1/2; 9th elytral stria complete; interstriae with distinct, fine punctation; disk at basal 1/4 with feeble to no indication of transverse depression.

Ventral Surface. Metasternum smooth throughout, with fine and very sparse punctures nearly evenly distributed. Abdomen smooth except laterally, there finely wrinkled; surface with sparse, small and moderate-sized punctation throughout.

Length. Body 4.8–6.7 mm.

Aedeagus. In lateral view (fig. 98) widest apically, apical tip weakly inclined upward, upper apical margin nearly straight; in dorsal view sides subparallel, orifice overlaid by a single, small lobe; internal processes symmetrical in dorsal view, clearly in form of a human figure.

Type Material

Two syntypes of *L. solani* from the Bosc collection (MNHP) have been sent to me. One of these bears a Fabricius label and is hereby designated (and labeled) as the lectotype. It bears the data “*C. Solanei* [sic], h. in Carolina, Bosc; Museum Paris, Collection Bosc; COTYPE; *Lema solani* (Fab.), A. Descarpentries.”

Material Examined

The specimens examined totaled 395 and were collected in the following locations. **Alabama**—Mobile. **Delaware** (no locality given). **Florida**—Dade Co.; Lake Co.; Monroe Co.; Highlands Co.; Leesburg; DeLeon Spgs.; Broward Co.; Polk Co.; Winter Garden; Orange Co.; Miami; Enterprise; Sanford; Orlando; Crescent City; South Bay; Gainesville; Jacksonville; Florida City; Biscayne Bay; Lake Mary. **Georgia**—Talulah Falls; Thomasville. **Louisiana**—Buras; Poydras?; Docville; New Orleans; Grand Isl.; Venice; Port Sulphur; Norco. **Mississippi**—Poplarville. **New Jersey**—Anglesea. **North Carolina**—Raleigh. **South Carolina**—Florence. **Tennessee**—Nashville. **Texas**—Houston. **Virginia**—Fredericksburg; L. Drummond.

Distribution

This species occurs from Eastern United States to Texas (fig. 75).

Hosts

Label data follow: On potato leaf; on tobacco; on *Solanum nigrum*; on *Solanum* foliage; on nightshade; on bean; on *Bombeya*?; on cabbage; at *Solanum*. The hosts reported in the literature agree with those on the specimen labels.

Remarks

The pronotum is nearly always light colored throughout in this species. Of the 189 USNM specimens of *L. solani* examined, only 16 show even a weak indication of the dark discal spot. This spot is shown at its maximum development in figure 18b.

Enlargement of the light elytral band occurs more frequently than reduction (fig. 18b). The most extreme enlargement (fig. 18a) was seen in just a single specimen; usually enlargement is much less extensive. It should be noted that the specimen with this extreme enlargement is asymmetrical in color pattern: the right elytron only is dark at its basal one-fourth.

For a discussion of the characters that distinguish *L. solani* from its nearest relative, *L. balteata*, see under the latter.

Lema trabeata
Lacordaire, New Status
(figs. 14, 76, 99)

Lema confusa trabeata Lacordaire, 1845:409; Gemminger and Harold, 1874:6 (world catalog); Clavareau, 1913:59 (world catalog); Schaeffer, 1920:321 (taxonomy); Leng, 1927:44 (N. Amer. checklist); Blatchley, 1928:71 (distribution); Schaeffer, 1933:306 (in key); Blackwelder, 1939:61 (N. Amer. checklist); Blackwelder, 1946:629 (Amer. checklist); Pallister, 1953:9 (distribution); Monros, 1960:207 (world checklist); Wilcox, 1974a:6 (N. Amer. checklist); Wilcox, 1974b:8 (Amer. checklist).

Diagnosis

Head and pronotum entirely black; each elytron black with a pattern of basal and apical light markings, light markings may join to form a light stripe; occurs from Florida to Arizona. (May be difficult to distinguish from *L. confusa*.)

Description

General. Body, appendages, and dark markings on elytra dark brown to (nearly always) black, with yellow to orange near base of head, on elytra, and at sides of 5th abdominal segment. Dark elytral markings as follows: Along suture from base to apex (but narrow on declivity), much of disk (not at basal 1/5 and not at lateral margin), a moderate-sized spot at apex. Dorsal body surfaces shiny; ventral body surfaces more or less shiny.

Color Variation. Elytra with basal yellow area reduced and apical yellow spot much reduced, as in figure 14b, or basal yellow area expanded and joining apical yellow spot, as in figure 14a; light markings near base of head often reddish, infrequently expanded.

Head. An antenna 1/2 to 2/3 as long as body; vertex with fine to moderate punctation anteriorly and without groove; clypeus with moderate-sized punctures around margins and with a few large punctures near middle.

Pronotum. Anterior width subequal to basal width; constriction located at middle, width at constriction about 85%–87% of width at apex; surface with small to (usually) moderate-sized punctation located anteriorly along midline and anteriorly on each side; below basal 1/3, a transverse depression with a moderate-sized, median pit.

Elytra. Punctures of striae large to moderate, not close, 3d stria with 10–13 punctures in basal 1/2; 9th elytral stria complete, with no gap; interstriae with sparse, small to minute punctures and some irregular wrinkling; disk not or weakly depressed on each side above basal 1/3.

Ventral Surface. Metasternum with fine punctation, moderate in density, nearly absent posteriorly near middle; surface smooth, shiny. Abdomen with sparse, moderate-sized punctation nearly throughout, most dense at sides; surface smooth, shiny.

Length. Body 5.2–6.7 mm.

Aedeagus. In lateral view (fig. 99) widest apically, apical tip weakly inclined upward, upper apical margin weakly concave; in dorsal view widest medially,

sides weakly sinuate, orifice overlaid by a single moderate-sized lobe; internal processes in dorsal view symmetrical, form clearly of a slender human figure.

Type Material

The holotype of *L. trabeata* was not located in either the British Museum of Natural History, in London, or the Institut Royal Sciences Belgique, in Brussels, museums in which some of the Lacordaire types have been deposited. The location of the type is not known. While I was in the Museum National d'Histoire Naturelle, in Paris, in 1977, Nicole Berti suggested to me that Lacordaire types might be in Helsingfors, Sweden. Inquiry directed to the Universitetets Zoologiska Museum, in Helsingfors, brought the response from Hans Silfverberg that Lacordaire types were not there.

In Lacordaire (1845:409), varieties A and B are listed beneath *Lema confusa*; on the same page varieties C and D are listed beneath *Lema trabeata*. On page 411, following a discussion of the characters of the four varieties, Lacordaire states: "Il se trouve au Mexique, dans L'Amerique Centrale, dans les parties orientales de la Columbia et à Cuba." There is thus no clear designation of a type locality for *L. trabeata*.

Material Examined

I examined 113 specimens collected in the following locations. **Arizona**—Patagonia; Huachuca Mts.; Santa Rita Mts.; Cochise Co.; Santa Cruz Co.; Portal, Chiricahua Mts. **Florida**—Ft. Lauderdale; W. Palm Beach; Palm Beach; Indian River Co.; Dade Co.; Fort Pierce; St. Lucie Co.; Sanford; Lake Worth; Miami; Crescent City. **Mississippi**—Belzoni. **Texas**—Big Bend N.P.; Jeff Davis Co.; Cotulla; Houston; Del Rio; Davis Mts.

Distribution

Lema trabeata is known from Florida to Arizona (fig. 76).

Hosts

Label data follow: *Physalis pubescens*, *P. angulata*; *Chamaesaracha coniooides*; *Datura stramonium*; *Ligustrum* sp.; on pepper; on ground cherry; on cucumber.

Remarks

This taxon has to the present been treated as a subspecies of *L. confusa*; however, distribution data confirm the status of *L. trabeata* Lac. not as a valid subspecies but, rather, as a full species. Specimens of *L. confusa* I have seen occur along the eastern coast of Florida, from Miami north to St. Lucie Co. Specimens of *L. trabeata* occur in the same region as *L. confusa*, to farther north to inland of Cape Canaveral, to Gainesville. Each coastal collection of *L. confusa* is almost exactly matched locationwise by a collection of *L. trabeata*.

Lema. trabeata has also been taken at Pied r Negras, Costa Rica; at Pedregal, Panama; and at Popavun-Abbe Gaujon and Valle del Cauca, Columbia.

For a discussion of the characters that distinguish *L. trabeata* from the similar *L. confusa*, see under the latter.

***Lema trilinea* White**
(figs. 7, 49, 51, 84, 100)

Crioceris trilineata Olivier, 1808:739 (junior primary homonym of *trilineata* Fabricius, 1787); Harris, 1833:580 (distribution); Emmons, 1854:17 (taxonomy); Scudder, 1891:172 (host).

Lema trilineata (Oliv.): Dejean, 1821:114 (world checklist); Dejean, 1837b:386 (world checklist); LeConte, 1849:34 (distribution); Walsh, 1866:25 (taxonomy); Clark, 1866:31 (world catalog); Riley, 1869:99 (biology); Walsh and Riley, 1868:26 (biology); Walsh and Riley, 1869b:235 (biology); Saunders, 1871:43 (taxonomy); Pettit, 1872:12 (distribution); Clementi, 1872:37 (distribution); Crotch 1873a:26 (taxonomy); Crotch, 1873b:94 (N. Amer. checklist); Gemminger and Harold, 1874:3258 (world catalog); Henshaw, 1874:23 (N. Amer. checklist); LeConte, 1876:519 (distribution); Popenoe, 1877:34 (distribution, host); Schmelter, 1878:55 (distribution); Hubbard and Schwarz, 1878:640 (distribution); Schwarz, 1878:458 (distribution); Dury, 1879:11 (distribution); Jacoby, 1880:6 (taxonomy); Zesch and Reinecke, 1881:x (distribution); Couper, 1883:219 (distribution); Henshaw, 1885:105 (N. Amer. checklist); Jacoby, 1888:17 (taxonomy); Smith, 1890:241 (distribution); Baker, 1895:28 (host); Hamilton, 1895a:339, 370 (distribution); Horn, 1895:229 (distribution); Castle and Laurant, 1896:309 (distribution); Wickham, 1896a:74 (taxonomy); Lugger, 1899:135 (distribution); Walker, 1899:58 (sound organs); Lugger, 1899b:220 (pupal overwintering); Zabriskie, 1900:206 (stridulation); Smith, 1900:299 (distribution); Cockerell, 1902:379 (distribution, host); Dury, 1902a:58 (distribution); Dury, 1902b:164 (distribution); Ulke, 1902:27 (distribution); Wickham, 1902:284 (distribution, host); Jacoby and Clavareau, 1904:15 (world catalog); Snow, 1906:170 (distribution); Cockerell and Fall, 1907:194 (distribution, host); Stevens, 1909:109 (chromosome number); Easton, 1909:53 (distribution); Wickham, 1909:30 (distribution); Smith, 1910:338 (distribution); Blatchley, 1910:1111 (taxonomy); Heffinger and Hopkins, 1910:10 (distribution); Clavareau, 1913:81 (world catalog); Leng and Mutchler, 1914:451 (Amer. checklist); Johnson, 1916:120 (distribution); Chagnon, 1917:239 (distribution); Dozier, 1918:370 (distribution); Leng, 1920:287 (N. Amer. checklist); Britton, 1920:273 (distribution); Dickerson and Weiss, 1920:69 (distribution, host); Notman, 1920:22 (distribution); Dozier, 1922:117 (distribution); Hatch, 1924a:581 (distribution); Hatch, 1924b:308 (distribution); Andrews, 1923:320 (distribution); Blatchley, 1924:39 (distribution, hosts); Chittenden, 1924:46 (egg parasite); Leng and Davis, 1924:65 (distribution); Brisley, 1925:167 (biology); Leonard, 1928:462 (distribution, host); Douglass, 1929:4 (distribution, hosts); Hendrickson, 1930:105 (distribution); Schaeffer, 1931:148 (taxonomy); Schaeffer, 1933:303 (taxonomy); Criddle and Handford, 1933:150 (biology); Whelan, 1936:114 (distribution); Chagnon, 1937:226 (taxonomy); Brimley, 1938:221 (distribution, host); Powell, 1941:154 (taxonomy); Thomas, 1943:631 (distribution); Smith et al., 1943:319 (distribution); Sailsbury, 1943a:67 (larval morphology); Sailsbury, 1943b:133 (taxonomy); Hughes, 1944:130 (distribution); Blackwelder, 1946:632 (Amer. catalog); Fattig, 1948:5 (distribution); Löding, 1945:126 (distribution); Tuthill, 1949:330 (biology); Omer-Cooper and Miles, 1951:330 (distribution, host); Smith, 1953:42 (chromosomes); Pallister, 1953:7 (distribution); Wilcox, 1954:378 (taxonomy); Peterson, 1957:77 (larval morphology); Sengupta, 1957:473 (hosts); Monros, 1960:208 (world checklist); Force, 1966:1112 (host plant selection); Kaufmann, 1967:363 (biology, larva); Kogan and Goeden, 1969:319 (feeding preference); Hatch, 1971:164 (taxonomy); Yadav and Pillai, 1974:97 (chromosomes); Wilcox, 1974a:7 (N. Amer. checklist); Wilcox, 1974b:9 (Amer. checklist); Mason and Lawson,

1978:398 (killing and preserving larvae); Wilcox, 1979:5 (hosts); White and Day, 1979:209 (distinct from *trivittata*, distribution, biology, breeding experiments); White, 1981:50 (taxonomy).

Lema trivittata californica Schaeffer (lapsus calami, *trilineata* intended); junior primary homonym, Heinze, 1927b), 1933:301; Fall and Davis, 1934:144 (distribution); Holdaway, 1941:8; Krauss, 1944:7 (hosts in Hawaii); Krauss, 1947:4 (distribution, host); Bianchi, 1954:266 (biology); Monros, 1960:222 (world checklist).

Lema trilineata nigriventris Fall, 1928:238; (a junior primary homonym of *nigriventris* Gerstaecker, 1871); Davis, 1932:85 (distribution); Leng and Mutchler, 1933:44 (distribution); Moore, 1937:92 (distribution, host); Monros, 1960:208 (world checklist).

Lema trilineata daturaphila Kogan and Goeden, 1970a:529 (taxonomy); Kogan and Goeden, 1970b:537 (biology); Kogan and Goeden, 1970c:1175 (host plant range); Kogan and Goeden, 1970d:1285 (stridulation); Kogan and Goeden, 1971:1435 (feeding and host selection); Wilcox, 1974a:7 (N. Amer. checklist); Wilcox, 1974b:9 (Amer. checklist). New synonymy.

Lema trilinea White (replacement for junior primary homonym *trilineata* Oliv.), 1981:50.

Diagnosis

Elytra with 3 black, longitudinal stripes, lateral stripes 3 or more intervals in width; head rarely with black in interocular area; pronotal dark markings discal; distribution, nearly entire United States.

Description

General. Body mostly yellow to yellow orange to dull orange. Following are black: Most of antennae, 2 spots on pronotum, sutural and lateral stripes on each elytron, roughly apical 1/2 of each tibia, all tarsi. Sides of metasternum often narrowly black. Dorsal body surfaces shiny; ventral body surfaces more or less shiny.

Color Variation. Complex, most specimens as follows: First antennal segment light, 2d segment sometimes light in part; head rarely with black; pronotal spots sometimes reduced to missing, sometimes a little enlarged, rarely expanded and joining; lateral sutural black stripe normally covering 3–4 intervals; black area on tibiae ranging from a little less than 1/2 of tibia to nearly entire tibia. Variations exhibited by melanic eastern form as follows: Sometimes with black on head; pronotal spots expanded; elytral dark stripes expanded greatly and narrowly to broadly joined behind middle of elytron (fig. 7b). Color variations exhibited by many California specimens as follows: Legs and ventral surface mostly to almost entirely black; head partly to entirely black; pronotal spots often enlarged and nearly square, joined, or covering nearly entire pronotum; sutural black stripe sometimes enlarged to span part of 1st interval; lateral black stripe covering 3–4 intervals, never joining sutural stripe.

Head. An antenna a little shorter than to about 1/2 as long as body; vertex with a narrow, median, longitudinal groove or with median fovea. Clypeus with scattered, moderate-sized and large punctation.

Pronotum. Width slightly greater than length; constriction at middle distinct, broad; width at constriction about 79%–86% of apical width; punctures coarse, not dense, located medially from anterior margin to constriction and anteriorly on each side; at basal 1/3, a transverse depression with a median, moderate-sized fovea.

Elytra. Most specimens (see variation above) with lateral black stripe covering 3–4 intervals; punctures of striae moderate in size, not close; 3d stria with 10–15 punctures in basal 1/2; 9th stria complete; interstriae with small punctures and feeble or no wrinkling; disk without basal depression.

Ventral Surface. Metasternal punctation fine, sparse, most dense anteriorly at side, nearly absent at middle. Abdomen with small to moderate-sized punctures, most dense at sides, sparser medially; surfaces at sides often irregular.

Length. Body 5.7–8.0 mm.

Aedeagus. In lateral view (fig. 100) widest apically, apical tip directed forward, upper apical margin concave; in dorsal view somewhat widest apically, orifice overlaid with a moderate-sized lobe; internal processes in dorsal view symmetrical, clearly of a human form.

Type Material

Part of the Olivier collection is deposited in MNHP, but the type of this species was not found there in a visit of 1977; so I do not know its location. In the original description of *L. trilineata* the locality of collection is given as “Amerique septentrionale.” Following that is given, “type—Du Mus. d’Hist. Nat.”

Material Examined

Close to 2,200 specimens of *L. trilinea* were examined. These were collected in the following locations. **Arizona**—Prescott N.F.; Bottom Grand Canyon N.P.; San Simon Rd. nr. Portal; Carrizo Creek, Navajo Co. **Arkansas**—Prairie Grove, Wash. Co. **California**—Palm Spgs.; San Francisco; Sylvan Co.; Lemoore Cove; Kern Co.; San Diego; Painted Can.; Pine Val.; Carpenteria; L.A. Co; Mecca; Pasadena; Irving; Laguna Beach; San Bernardino Co.; Anaheim; Garden Grove; Long Beach; Norwalk; Monterey; Orange Co.; Thomas Camp, Riverside Co.; S.D. Co. Morena Lake; El Monte; Northridge; Arcadia; LaVerne; Santee; El Cajun Mts.; Julian; Kawean; Santa Barbara Co.; Santa Monica; Vista. **Colorado**—Col. Springs; LaVeta. **Connecticut**—Stamford; New London; S. Windsor. **District of Columbia**. **Florida**—S. Daytona; Big Pine Key; Ft. Lauderdale; Jacksonville; Pinellas Co.; Avalon; Dade Co.; Wabasso; Gainesville; Ft. Walton Beach, Okaloosa Co.; Big Copper Key; Camp Crystal, Clay Co.; Volusia Co.; Boynton Beach; Liberty Co., Torreya St. Pk.; Alachua Co.; Gold Head Branch St. Pk., Clay Co. **Georgia**—St. Simmons Isl.; Rabun Co.; Athens; Atlanta. **Illinois**—Lyons; Chicago; St. Joseph; Lafayette; Franklin Park; Decatur; Algonquin; Urbana. **Indiana**—Lafayette; Indianapolis; Jefferson Co. **Iowa**—Clermont; Lake Okoboji; Lucas; Iowa City; Ames. **Kansas**—Lawrence; Atchison Co.; Riley Co.; Wellington; Topeka; Sedgewick Co.; Riley Co. **Maryland**—Annapolis; Baltimore; Beltsville; Glen Echo; Hagerstown. **Massachusetts**—Ipswich; Staughton; Sherborn; N. Saugus; Springfield; Arlington;

Aguawam; Melrose, Cambridge; Milton; Northampton; N. Sanders. **Missouri**—Mound City, Holt Co.; Columbia; Marionville; Ranken, St. Louis Co.; Moberly, Randolph Co.; Dirksville, Adair Co.; Vernon Co.; Callaway Co.; St. Charles Co.; Colden; New Hartford; McDonald Co. **Nebraska**—Lincoln. **New York**—Buffalo; Ithaca; Cold Sp. Harbor; Yaphank L.I.; W. Point; Little Falls; Eastport; Hartsdale; Keesville; W. New Brighton; Larchmont; Concord; S. Fallsburgh; Albany; Poughkeepsie; Roslyn L.I.; Allegheny St. Pk.; Newark; Willard, Seneca Co.; Delmar. **New Jersey**—Lucaston; Summit; Boonton; Arlington; Haddon Hts.; Palisades; Orange; Moorestown. **Nevada**—Las Vegas. **North Carolina**—Raleigh; Black Mts.; S. Pines. **North Dakota**—5 mi SW McLeod. **Ohio**—Columbus; Sugar Grove; Hocking Co.; Put-in-Bay; Delaware Co.; Ashtabula Co.; Crawford Co.; Clinton Co.; Cavallo; Jefferson; Lucas Co.; Cincinnati; Sandusky; Portage Co. **Oklahoma**—Cleveland Co.; Garfield Co. **Oregon**—Talent. **Pennsylvania**—Glenolden; Jeannette; Belfast; Hummelstown; Canadensis, Monroe Co.; Philadelphia; North Central; Fairview; Linglestown; Boxborough; North East; St. College. **South Carolina**—Eureka; Hilton Head Isl.; Aiken; Myrtle Beach. **Texas**—Houston. **Utah**—Zion Canyon; Bellvue. **Virginia**—Rosslyn; Vienna; E. Falls Church; Fredericksburg; Bluemont; Arlington; Pennington Gap. **Vermont**—Brattleboro. **West Virginia**—Fairmont. **Wisconsin**—Shawano Co.; Clintonville; Madison; Dane Co. **Canada**—Manitoba, Aweme; Quebec, Hull; Beech Grove; Aylmer; Cantley-Touraine.

Distribution

This species occurs nearly throughout the United States and into southern Canada (fig. 84). The greatest gap in the range occurs in Northwestern United States.

Hosts

Literature notes are as follows: *Solanum dulcamara*; on *Physalis alkekengi* L.; Japanese lantern; reared potato; Chinese lantern; on *Physalis*; Jimson weed; on corn; on sweet corn; on beans; on *Datura stramonium* L.; on *Nicandra physalodes* (L.) Gaertn. [sic]; feeding on belladonna. These notes are from White and Day (1979:216) and come from label data on specimens then examined. Other literature notes on hosts follow: *Physalis virginiana* (Wickham 1902:284); alfalfa, clover, salvia, solidago, sorghum, sunflowers (Douglass 1929:4); ground cherry, potato, horse-nettle (Blatchley 1924:39); gooseberry (Omer-Cooper and Miles 1951:330); tree tobacco (Krauss 1941:10); *Amaranthus*, *Solanum tuberosum* L. (Wilcox 1979:5).

Remarks

I have amassed the California distribution records of all specimens of *L. trilinea trilinea* and *L. trilinea daturaphila* (old usage) available to me and plotted the ranges. The California specimens of *L. t. trilinea* totaled 70, and *L. t. daturaphila* totaled about 700. If the two were actually subspecies, the ranges would be expected to narrowly overlap, that is, the species would be expected to be largely allopatric; but that is not the case. The range of specimens assignable to *L. t. daturaphila* actually overlaps broadly with California range of *L. t. trilinea*, the area of overlap being 100 to 160 miles in width and extending from north to south for over 500 miles. Representing the eastern extreme of the range of *L. t. daturaphila* are specimens I have from 20 miles northeast of Yuma, Arizona, and from Panamint Mountains (Inyo Co.), California. The western limit of the range of *L. t. trilinea* is represented by specimens

from Antioch (Contra Costa Co.), Paraiso Springs (Monterey Co.), Lower Cuyame Valley (Santa Barbara Co.), Westwood Hills, Los Angeles, and San Diego. The northernmost sites from which *L. t. daturaphila* and *L. t. trilinea* have been collected are, respectively, Talent, Oregon, and Red Bluff (Tehama Co.), California.

Figure 7c shows the greatest development of melanism of specimens assignable to the category *L. t. daturaphila*.

I have seen a lengthy series of specimens taken from Chinese lantern at Ottawa, Ontario (in CNCI). Most of these by elytral color characters are clearly *L. trilinea*; however, the specimens vary in width of the lateral elytral black stripe. The extent of the variation is such that 2 specimens (of over 30) nearly match *L. trivittata* in appearance, their lateral dark stripe spanning but 2 intervals for most of its length.

The eastern melanic form of *L. trilinea* seems to occur in much of Eastern United States. Figure 7b shows the extreme development of melanism. Specimens from Rock Creek Park, the District of Columbia, exhibit the pattern illustrated. I have seen similar melanic specimens from Moorestown, New Jersey; Hartsdale, New York; and Washington Co., Arkansas.

For many years *L. trivittata* was treated either as the same species as *L. trilinea* (then known as *trilineata*) or a subspecies of it. For that reason some of the references listed above have doubtless confused the two species. To accurately sort out those references would be difficult to impossible.

For a discussion of the differences between *L. trilinea* and *L. trivittata*, see under the latter.

***Lema trivittata*
trivittata Say**
(figs. 9, 85, 101)

Lema trivittata Say, 1824:429; Lacordaire, 1845:545 (taxonomy); Emmons, 1854:134 (taxonomy); Clark, 1866:31 (world catalog); Crotch, 1873b:94 (N. Amer. checklist); Jacoby and Clavareau, 1904:15 (world catalog); Clavareau, 1913:81 (world catalog); Leng, 1920:287 (N. Amer. checklist); Löding 1945:126 (distribution); Blackwelder, 1946:632 (Amer. checklist); Monros, 1960:208 (world checklist); Wilcox, 1974b:9 (Amer. checklist); White and Day, 1979:209 (distinct species, taxonomy, biology, distribution, breeding experiments); Peterson and Dively, 1981:78 (effect on host of feeding).

Crioceris trivittata (Say), Harris, 1833:580 (distribution).

Lema immaculicollis Chevrolat, 1835:112; Monros, 1960:208 (world catalog).

Lema trivirgata LeConte (junior primary homonym, not Lacordaire, 1845), 1859: 22; Jacoby and Clavareau, 1904:15 (world catalog); Snow, 1907b:56 (distribution); Snow, 1907c:180 (distribution).

Lema lecontei Clark (replacement for *trivirgata* LeC.), 1866:31 (world catalog).

Lema trilineata trivirgata LeC., Crotch, 1873a:26 (taxonomy).

Lema trilineata trivittata Say, Schaeffer, 1933:302; Knowlton and Smith, 1935:242 (distribution); Blackwelder, 1939:61 (N. Amer. checklist); Brimley, 1938:221 (distribution); Löding, 1945:126 (distribution); Fattig, 1948:5 (distribution); Balsbaugh and Hays, 1972:21 (taxonomy); Wilcox, 1974a:7 (N. Amer. checklist); Wilcox, 1979:9 (host).

Diagnosis

Elytra with 3 black, longitudinal stripes, lateral stripes 2 to 2 1/2 intervals wide; found nearly throughout United States.

Description

General. Body predominantly yellow to yellow orange to dull orange, with following black: Most of antennae, sutural interval of elytron, elytral stripe from humerus to apex, side of mesosternum and metepisternum, tibial apices, tarsi. Dorsal body surfaces shiny; ventral body surfaces more or less shiny.

Color Variation. Often with black along dorso-anterior margin of each eye; sometimes vertex with a pair of black spots (1 on each side of middle), spots sometimes expanded or joined; base of head sometimes black from sides to vertex; infrequently frons with 1 black spot at middle; antennae with 1st segment light, 2d segment usually light, 3d and 4th segments sometimes light beneath; pronotum usually with 2 black spots of variable size, 1 on each side and anterior to middle. When ventral surface at maximum development of dark markings, much of side of mesosternum and much of coxae black; sometimes apex of 1st abdominal segment black. Tibial apices and tarsi sometimes brown, often with femoral apices more or less darkened.

Head. An antenna less than 1/2 as long as body; vertex usually with a shallow, longitudinal groove anteriorly and a small fovea behind groove; clypeus with moderate-sized and large punctation.

Pronotum. Width slightly greater than length; constriction at middle broad, width at constriction about 79%–86% of apical width; with coarse, not dense punctures anteriorly along midline and anteriorly on each side; at basal 1/3, a transverse depression with a moderate-sized medial fovea.

Elytra. Lateral black stripe extending from humerus to near apex, stripe covering intervals 8 and 9 near middle, interval 9 near apex, and 2 to 2 1/2 (rarely nearly 3) intervals at widest point. Punctures of striae moderate in size, not close; 3d stria with 10–15 punctures in basal 1/2; 9th stria complete.

Ventral Surface. Metasternal punctation fine, sparse, densest anteriorly at side, nearly absent medially. Abdomen with small to moderate-sized punctures, most dense at sides, sparser medially, surfaces at sides often a little irregular.

Length. Body 5.1–7.3 mm.

Aedeagus. In lateral view (fig. 101) widest apically, apical tip directed forward, upper apical margin concave; in dorsal view somewhat widest apically, orifice overlaid with a moderate-sized lobe; internal processes in dorsal view symmetrical, clearly of a human form.

Type Data

Because virtually all of the Thomas Say collection is lost, I herein designate a neotype for *Lema trivittata* Say. The following statement was included with the original description of *L. trivittata* (Say 1824:430): "I obtained specimens of this species from the vicinity of the Rocky Mountains." I have selected as a neotype a USNM specimen from Colorado with the following data, "Colo. Spr. Colo., H.F. Wickham, June 15–30, '69, 6,000–7,000 ft.; Wickham Collection 1933."

Material Examined

I examined 1,640 specimens. Their sources follow. **Alabama**—Mobile. **Arizona**—Sabino Canyon; Prescott; Sasabe; Palmerlee; Yuma; Hot Springs; Ft. Grant; Galiuro Mt.; Hereford; Huachuca Mts.; Congress Jc.; Williams; Ash Fork; Tucson; Mt. Lemmon; Patagonia; Chiricahua Mts.; Apache Co.; Santa Rita Mts.; Globe; Pinal Mts.; Santa Catalina Mts.; Pima Co.; Lake Roosevelt; Cochise Co.; Yavapai Co.; Pajarito Mts.; Natural Bridge; White Mts.; Nogales; Wilcox; Kaibab Plateau; Holbrook; Carr Canyon; Baboquivari Mts.; Gila Co.; Flagstaff; Portal; Littlefield. **Arkansas**—Leslie; Washington Co.; Van Buren Co. **California**—Painted Canyon; Jacumba; La Verne; Palm Springs; Riverside; Needles; Imperial Co.; Mason Valley; Coachella Valley; Anza; Palm Canyon; Panoche Hills; Mill Creek, San Bern. Co.; San Luis Obispo Co.; San Diego Co.; La Junta; El Conjon. **Colorado**—10 mi N. Ft. Collins; 17 mi. SE Col. Spgs.; Colorado Spgs.; Rocky Ford. **District of Columbia**. **Delaware**—Greenwood. **Georgia**—Barnsville; Athens, Clark Co.; Experiment; Thomasville. **Illinois**—Urbana; Springfield; Algonquin; Pocaahontes. **Indiana**—LaFayette; Indianapolis; Jefferson Co.; Posey Co.; Tippecanoe Co. **Kansas**—Wilson Co.; Pot. Co.; Onaga; 5 mi. NE Winfield; Oswego; Riley Co.; Mead Co.; Topeka; Douglas Co. **Kentucky**—Christian Co.; Campbell Co. **Louisiana**—Zachary. **Maryland**—Baltimore; 3 mi S. Kenwood Bch.; Hurlock; Princess Anne; Hagerstown; Chesapeake Bch.; Great Falls. **Massachusetts**—Blue Hills. **Michigan**—Ecorse; Niles; Berrien Co. **Mississippi**—Greenwood; Fort Snelling; Bolivar Co. **Missouri**—Lathrop; Columbia; Weldon Sp., St. Charles Co.; Mt. Vernon, Lawrence Col.; Mound City, Holt Co.; Moberly, Randolph Co.; Tucker Prairie, Callaway Co.; Ranken, St. Louis Co.; Ferguson; Boone Co.; Campbell; New Madrid Co.; Risco; Fulton; Charleston; Blackjack. **Nebraska**—Lincoln. **New Jersey**—Riverton; Surf City; Marlboro; Morrestown; Goshen. **Nevada**—Las Vegas; Caliente, Lincoln Co. **New Mexico**—4 mi W Maljamar; Jemez Mts.; San Jon; Tatum; Elephant Butte; N. Melrose; Torrance Co.; Koehler; Albuquerque. **New York**—Yaphank L.I.; Willard, Seneca Co.; Rock Beach; Ithaca; Rockaway B. **North Carolina**—Raleigh; Rocky Mt.; Raison; Salisbury; Currituck Co. **Ohio**—Highland Co.; Erie Co.; Putnam Co. **Oklahoma**—Oklahoma Co.; Lawton. **Pennsylvania**—Philadelphia. **South Carolina**—Myrtle Bch., Swansea. **Tennessee**—Clarksville; Nashville. **Texas**—Brownsville; Hunt Co.; Davis Mts.; Brewster Co.; Uvalde Co.; Val Verde Co.; Kenedy; Starr Co.; Kerrville; 10 mi W Ft. Davis; Lajitas; Big Bend Nt. Pk.; Donna; Haskell; Alpine; Uvalde; Sheffield; Presidio; Calvert; Childress; Cotulla; Columbus; Victoria; Port Laraca; Gainesville; Wichita Falls; Wolf City; Marfa; Willis; Dallas; Edinburg; Bangs; Mission; Weslaco; Pharr; McAllen; Corpus Christie; Wades; College Station; San Benito; El Paso; Harlingen. **Utah**—Honeyville; Zion Nt. Pk.; Kane Co.; Salt Lake; Ogden; Provo; Bellevue; St. George; Santa Clara; Logan. **Virginia**—Arlington; Vienna; Belvoir, Faq. Co. **West Virginia**—Fairmont. **Wisconsin**—Madison. **Wyoming**—Torrington; Huntley. **Canada**.

Manitoba—Aweme; 2 mi W Stakton. **Ontario**—Lennox Co.; Chatham; Leamington; St. Thomas; Lamark, Kerr Lake; Port Rowan; Tilbury; Ancaster; St. Lawrence Isl. N.P.; Britania; St. Cath.; Pr. Edward Co.; Orillia. **Quebec**—Beech Grove; Cantley, Touraine.

Distribution

Lema trivittata trivittata occurs nearly throughout the United States and into southern Canada (fig. 85). Significant gaps in the distribution occur in North-eastern and in Northwestern United States.

Hosts

Literature notes follow: Jimson weed; ex *Datura*; *Datura stramonium* L.; on *Datura quercifolia* H.B.K.; in cornfield; on strawberry; on *Physalis*; on *Hyoscyamus*; on *Atropa belladonna* L.; wild barley; on sunflower; cotton bud; bred from *Solanum*; on *Chamaesaracha conioides* Britton; wheat; on English pea foliage; on tomato leaves; with string bean leaves; feeding on potato; on Irish potato foliage; on okra leaves; on *Melilotus indica* (L.) All. foliage; with parsley roots and leaves; *Solanum elaeagnifolium* Cav. The preceding notes are from White and Day (1979:216) and are excerpts from label data.

Remarks

Though the great majority of specimens of *L. trilinea* and *L. trivittata* are readily distinguished to species by the characters given in the key herein, a small number of specimens show an overlap of the characters and can complicate attempts at identification. I identify such specimens by using the array of characters given on page 215 in White and Day (1979).

I closely compared the external form of the aedeagi of *L. trilinea* and *L. trivittata*, and found no characters for distinguishing the two species. I also made M-400 photomicrographs of the aedeagi of three specimens of *L. trilinea* and of two specimens of *L. trivittata*, and found that the internal processes do not offer differences that would allow the species to be distinguished.

Lack of distinguishing differences in male genitalia between species that are reproductively isolated as shown by *L. trilinea* and *L. trivittata* is not without precedence in the Chrysomelidae. Krysan et al. (1983) in discussing *Diabrotica longicornis* and *D. barberi* stated, "Male genitalia and spermathecae and egg chorion sculpturing are normally good distinguishing characters for *Diabrotica* but not for these species."

Specimens of *L. trivittata* that exhibit enlargement of the head and pronotal dark markings seem to occur nearly throughout the range of the species. I have seen specimens with near maximum development of the black markings from Arizona, Utah, Texas, Michigan, Illinois, Indiana, New York, Vermont, Ohio, and Ontario. The most strongly pigmented specimen I examined (fig. 9b) was from Tippecanoe Co., Indiana.

For many years *L. trivittata* was considered to be either the same species as *L. trilinea* (now *L. trilinea*) or a subspecies of it. As a result there is doubtless confusion between these two species in some of the literature cited under the references listed for *L. trilinea*. To correctly sort out the references to these two species and be certain as to the proper assignment of all data are not now possible.

***Lema trivittata*
medionota Schaeffer**
(figs. 8, 77)

Lema trilineata medionota [sic] Schaeffer, 1933:303; Brimley, 1938:221 (distribution); Blackwelder, 1939:61 (N. Amer. checklist); Löding, 1945:126 (distribution); Fattig, 1948:5 (distribution); Monros, 1960:208 (world checklist); Balsbaugh and Hays, 1972:20 (taxonomy); Wilcox, 1974a:7 (N. Amer. checklist); Wilcox, 1974b:9 (Amer. checklist).

Diagnosis

Elytra with 3 black, longitudinal stripes, lateral stripes 2–3 intervals in width; pronotal dark markings discal; generally with at least a black spot on frons and black around each eye, spots sometimes joined to form a band; legs with black covering apical 1/2 to nearly all of legs; in Southeastern United States.

Description

Essentially identical in nearly all characters to *L. trivittata*.

Type Material

The type (in USNM) bears the data "Fla.; ex coll. of C. Schaeffer '35 Barber; Charles Schaeffer Collection; HS Barber Bequest 1950; *medionota* Schaeffer 33 Holotype USNM; *L. trilineata medionota* Schffr."

Material Examined

I examined 123 specimens collected in the following locations. **Florida**—Gainesville; Volusia Co.; Middle Cape Sable, Monroe Co.; Dade Co.; Hialeah; Stock Isl.; Ponte Vedra Beach; Siesta Key, Sarasota Co.; Fort Walton Beach, Okaloosa Co.; Merritt Isl., Boynton Beach; Miami; Putnam Co.; Howard, Dade Co.; Montecocha, Alachua Co.; Big Pine Key; Santa Rosa Isl., Santa Rosa Co.; Geneva; St. Lucie Co.; Pasco Co.; Tarpon Spring, Pinellas Co.; Everglades N.P.; Avalon; Collier Co.; Jacksonville; Marshes w. of Titusville; Paradise Key; Sanibel Isl.; Ft. Myers; Daytona; Ft. George; Indian R.; Riviera; Jensen; Walton; Piney Pt. Ferry, Tampa; Sanford; Capron; Palatka; Tampa. **North Carolina**—NC. **South Carolina**—Myrtle Beach; Murrills Inlet; Hilton Head Isl. **Virginia**—VA.

Distribution

Occurs from Virginia south to Florida (fig. 77).

Hosts

Label data follow: At *Physalis*; *Solanum* sp.; *Citrus sinensis*; on Irish potato; on lima bean leaves; on *Phaseolus vulgaris* leaves. By distribution alone a possible host is *Phaseolus viscosa*; its distribution—"In sands on and near the coast, Va. to N.C. and Fla."—matches that of *L. t. medionota*.

Remarks

The following are characters that can be used to distinguish between *L. t. medionota* Schaeffer and *L. t. trivittata*. *Lema t. medionota*: Interocular triangle rarely without black, nearly always black adjacent to eyes, often also with a spot on frons; sometimes interocular area all black; tibiae usually with black covering about apical 1/2 sometimes more than apical 1/2. *Lema t. trivittata*: Interocular triangle usually without black, may be spotted; head rarely mostly black; tibiae nearly always with tip to apical 1/3 black, infrequently with

nearly apical 1/2 black. Another character of use is the extent of black on the legs. *Lema t. medionota*: Legs often mostly to almost entirely black. *Lema t. trivittata*: Legs generally black in just apical 1/4–1/3, sometimes black in apical 1/2.

I am placing *L. t. medionota* as a subspecies of *L. trivittata*, not *L. trilinea*; however, all of these categories can be difficult to distinguish from one another due to intergrading of characters. My placement is based largely on geographical data: the range of *L. t. trivittata* does not seem to overlap more than just slightly the range of *L. t. medionota*, whereas the range of *L. trilinea* includes that of *L. t. medionota*.

I examined a specimen that I have concluded is *L. t. medionota*. The specimen bears no black at all between the eyes and was collected at Paradise Key, Florida.

Specimens of *L. t. medionota* generally have lateral elytral black stripes similar to those of *L. t. trivittata*, i.e., encompassing 2 to 2 1/2 intervals. However, in some specimens of *L. t. medionota* these stripes are as broad as those in *L. trilinea*, i.e., encompassing about three intervals. Thus on the basis of broadness of the lateral stripe, *L. t. medionota* can be confused with *L. trilinea*. In the specimen of *L. t. medionota* exhibiting the greatest development of the dark elytral stripes (from Tampa, Florida), each stripe covers four intervals and the sutural stripe covers two intervals (see fig. 8b). Generally specimens of *L. t. medionota* have at least a black spot on the frons and black around each eye; sometimes these spots are expanded and joined, forming a band between the eyes. Specimens of *L. trilinea* generally have no black in the interocular area, but when it is present, it is nearly always adjacent to each eye. In just three of the *L. trilinea* specimens I examined is there black in the interocular area, and these are melanic specimens with expanded dark elytral markings. One of these specimens, which exhibits the extreme development of melanic markings, is partly shown in figure 7b.

***Neolema* Montros, New Status**

Neolema Montros, 1951:472 (as subgenus), type species *N. histrionica* (Lac.), by monotypy.

Diagnosis

Distance between frons and vertex may or may not be closer than that between antennal tubercles. Prothoracic constriction strong to moderate, median to submedian. Elytra yellow, orange, or red, usually with a large, dark spot, or with spots, rarely predominantly light; punctures large to very large, may be poorly aligned; 9th stria with a gap of 5–12 punctures. Aedeagus in lateral view broad, widest medially to basally, apical margin concave to nearly straight; in dorsal view apical concavity overlaid with 3 lobes, 2 lateral lobes more or less concealing median lobe; from dorsal view internal processes of assorted forms.

Description

General

Length 4.0–5.3 mm.; basal color orange or red; elytra with 1–4 dark spots, or with predominating dark pattern.

Head

An antenna 1/2 to 2/3 as long as body, outer segments sometimes weakly expanded; vertex not enlarged; grooves between eyes distinct and deep, forming an X, frons and vertex usually more near to one another than are antennal tubercles, apex of frons usually located between antennal tubercles; eye notch shallow to deep; head distinctly constricted behind eyes.

Pronotum

Width a little greater than length; constriction median to submedian, deep to moderately deep; surface smooth and shiny, with small to moderate-sized punctures located medially in a longitudinal band from anterior margin to near base and also anteriorly on each side.

Elytra

Each elytron with 10 striae of usually clearly aligned punctures (rarely poorly aligned); punctures moderate to large in size (smaller apically); sutural stria absent; 9th stria with a gap; elytra about 1.5 times as long as wide.

Ventral Surface

Tarsal claws touching basally.

Remarks

The characters of *N. histrionica* follow: Antennal tubercles closer to one another than are frons and vertex. Prothoracic constriction strong, median. Body mostly red to orange. Elytra red, yellow, and black (yellow in 4 large spots, red medially and apically, black largely bordering yellow spots, forming wide bands preapically); 9th stria with a gap of 6–10 punctures. Aedeagus in lateral view widest medially, apical margin concave; in dorsal view apical concavity overlaid with 3 lobes.

Dissection of USNM specimens of *N. histrionica* showed the aedeagi to agree in form with those of North American species of *Neolema*.

**Species groups of
*Neolema***

The species *Neolema jacobina*, *N. ovalis*, and *N. ephippium* are sufficiently similar to allow them to be grouped together. *Neolema jacobina* and *N. ovalis* have similar sparse and somewhat confused elytral punctation. Their bodies are primarily light, although the elytral markings are much more extensive in *N. ovalis* than in *N. jacobina*. A specimen of *N. ovalis* with the least development of the dark markings (fig. 20a) resembles specimens of *N. jacobina* (fig. 1). The dark elytral markings of *N. ovalis* and *N. ephippium* (fig. 21) show obvious similarities; the elytral punctation of the latter, however, tends to be more confused. The lengths of these three species range from 4.0 to 5.3 mm.

The reddish color of *N. ephippium* indicates the similarity of this species to the next group, comprising *N. sexpunctata*, *N. adunata*, *N. cordata*, *N. gundlachiana*, and *N. quadriguttata*. These five species are small to medium sized, their lengths ranging from 3.7 to 6.3 mm. The elytral punctation of *N. quadriguttata* is even sparser and more confused than that of the species in the preceding group. Similarities between the elytral patterns of *N. sexpunctata*, *N. adunata*, *N. cordata*, and *N. gundlachiana* are obvious (figs. 22, 24, 25, 26). The most distinctive single character shown by any of these species is the much-elongated and slender antennae of *N. adunata*.

**Key to Species of
*Neolema***

1. Elytra entirely light or with only suture narrowly dark (fig. 1);
Kansas to Texas *jacobina* Linell
Elytra with much more extensive dark markings than above;
widely distributed 2
- 2(1). Elytra with a large, common apical spot; 1–3 basal spots may be
present, but much smaller (fig. 26);
Florida *gundlachiana* Suffrian
Elytra not as above 3
- 3(2). Elytra with 1 discal dark marking 4
Elytra with 2–4 discal dark markings 5
- 4(3). Legs dark throughout (fig. 21); Florida *ephippium* Lac.
Legs bicolored; (fig. 20) Midwestern to Southwestern
United States *ovalis*, n. sp.
- 5(3). Elytral basal dark marking shaped like a broad, upside-
down heart 6
Elytral disk not as above 7
- 6(5). Clypeus orange; apical dark markings of elytral disk rarely joined at
suture, not attaining apex; femora dark apically, light basally; (fig.
24); Eastern United States to Texas *cordata*, n. sp.
Clypeus at least partly black; apical dark markings of elytral disk
joined and extending to elytral apex; femora orange with a dorsal
dark spot, or mostly dark (fig. 22);
British Columbia *adunata*, n. sp.
- 7(5). Length 4.0–4.7 mm; 3d stria with 6–11 punctures in basal half
(fig. 23); Texas *quadriguttata*, n. sp.
Length 4.8–6.2 mm; 3d stria with 10–14 punctures in basal 1/2
(fig. 25); Eastern United States to Texas *sexpunctata* (Oliv.)

***Neolema adunata* White,
New Species**
(figs. 22, 71, 106)

Diagnosis

Ninth elytral stria with a gap of 6–8 punctures; elytra light with broad, joined, basal, and apical markings; clypeus at least partly black.

Description

General. Body mostly orange red to red. Following are black to dark brown: Antennae in part, clypeus and labrum, 3 spots on each elytron (humeral spot, large triangular basal spot, large oval apical spot, last 2 joined), sides of mesosternum and metasternum. Tibiae and tarsi more or less darkened. Dorsal body surfaces shiny; ventral body surfaces moderately shiny.

Color Variation. First antennal segment usually orange, remaining segments brown to dark brown to black; pronotum (2 specimens of 7) with an elongated, median dark spot; sometimes (2 of 7 specimens) elytra with a dark spot below and behind humerus, and spot may join with humeral spot (1 specimen); femora sometimes more or less darkened; 1 melanic specimen with antennae black throughout, most of head black, prothorax black, 2 larger spots of each elytron expanded, entire ventral surface and most of legs black.

Head. An antenna nearly $4/5$ as long as body. Vertex with a median pit or depression; surface with minute punctation, sometimes also with small punctation. Clypeus with small and moderate-sized punctation.

Pronotum. Anterior width subequal to basal width; constriction located a little below middle, width at constriction about 83%–90% of width near apex; surface with minute punctation throughout; surface also with small punctures present medially in anterior $2/3$ and anteriorly on each side; at basal $1/3$, a curving, transverse depression with a median pit.

Elytra. Punctures of striae large, not close, 3d stria with 10–12 punctures in basal $1/2$; 9th stria incomplete, with a gap of 6–8 punctures; interstriae with scattered fine punctures and little or no wrinkling; elytral disk moderately to weakly depressed above basal $1/3$.

Ventral Surface. Metasternum with fine punctation, moderate in density, sparse to nearly absent at middle. Abdomen with moderate-sized and small punctation, generally moderate in density, may be dense at middle; segments alutaceous at sides.

Length. Body 3.7–4.8 mm.

Aedeagus. In lateral view (fig. 106) widest medially, apical tip weakly inclined downward, upper apical margin weakly convex; internal processes in lateral view very narrow, elongated.

Type Material

All seven type specimens of *N. adunata* bear the data: “6 mi. E. Keremeos, B.C. 22. V. 1959, R.E. Leech.” The male holotype and four paratypes are in CNCI; two paratypes in USNM.

Distribution

Neolema adunata is known only from a single locality at the southern border of British Columbia (fig. 71).

Remarks

Neolema adunata is quite similar to *N. cordata*; the color differences are given in the key. There is more variation in the dark markings in *N. adunata* than in *N. cordata*, the markings involving head, pronotum, elytra, and legs. The typical color pattern of *N. adunata* is shown (fig. 22), and the variation is only in the direction of enlargement of the dark markings of that pattern. The extreme development of the dark markings on the head, pronotum, and elytra are depicted in figure 22a; the enlargement of the dark markings on the legs is not shown. The typical color pattern of *N. cordata* is shown in figure 24. In this species the variation is toward either reduction or enlargement of the dark markings (fig. 24 a or b).

The species name *adunata* (Latin) means joined or united and refers to the large elytral markings that are joined by a dark sutural mark.

***Neolema cordata* White,
New Species**
(figs. 24, 73, 102)

Lema albini Auctorum.

Diagnosis

Elytra orange to orange red and with a broad, basal dark marking shaped like an upside-down heart; clypeus orange; femora dark apically, light basally.

Description

General. Following are orange to orange red: Head, prothorax, much of elytra, mesothorax and metathorax medially, abdomen, and legs basally. Following black: Antennae except basal segments, elytral markings, sides of mesosternum and metasternum, dorsal part of profemora and mesofemora, apical portion of femora and remainder of legs. Dorsal body surfaces shiny; ventral body surface moderately shiny.

Color Variation. First antennal segment orange, 2d segment usually orange in part, remaining segments often light apically or ventrally; dark elytral markings variable (see fig. 24); black, sometimes brown, on dorsal part of profemora and mesofemora narrow or expanded, often expanded apically; apical 1/2 of metafemora usually entirely black; ventral surface at apex may be orange; tibiae and tarsi often brownish.

Head. An antenna clearly over 3/5 as long as body; vertex with a short, more or less distinct longitudinal groove and with fine punctation, moderate in density; clypeus with both fine and moderate-sized punctation.

Pronotum. Anterior width subequal to basal width; constriction located a little below middle, width at constriction about 80%–85% of apical width; surface with moderate-sized punctation located anteriorly along midline and on each side, surface with or without fine punctation; at basal 1/3, a curving, transverse depression with a median pit.

Elytra. Punctures of striae large, not close; 3d stria with 8–10 punctures in basal 1/2; 9th elytral stria incomplete, with a gap of 5–9 punctures; interstriae with virtually no fine punctation or wrinkling; disk clearly depressed on each side above basal 1/3.

Ventral Surface. Metasternum with fine to moderate-sized punctation, punctures largest medially, smallest laterally; surface alutaceous. Abdomen with moderate-sized and fine punctation, punctures largest medially on 1st segment; surface alutaceous.

Length. Body 4.3–5.3 mm.

Aedeagus. In lateral view (fig. 102) widest medially, apical tip inclined weakly downward, upper apical margin convex; in dorsal view orifice overlaid by 3 lobes, sides subparallel; internal processes symmetrical in dorsal view, form not clearly of a human figure.

Type Material

Complete label data for the type material are quoted below.

<i>Type material</i>	<i>Label data</i>
Male holotype (USNM)	Baton Rouge La., June 22 Apr. 1906; F.C. Pratt Collector.
Allotype (USNM)	Glen Echo, Md., Summer, 1922, J.C. Bridwell.
51 paratypes (USNM)	
5	Coleta, Alab.; H.H. Smith coll.
2	D.C.
1	Opelousas, La.
2	Suffolk Va., May 25, '31, J.C. Bridwell.
1	Washington, D.C.; Coll. Hubbard & Schwarz.
1	Fredericksburg, 8-5-91, Va.; W.D. Richardson coll., 1920.
2	St. Charles, Ark., White R. Refuge; Flood plain For.; S6: 7/9/43, [1 label has "slll," the other "s115"].
3	Rock Creek, May 31, 1902, Washington, D.C.; <i>Lema</i> Lac., <i>ephipiata</i> .
1	Rock Creek, May 27, 1906, Washington, D.C.; C.E. Burden Collection, 1913.
1	Micanopy, Alachua Co., 6 Mar '7, FLA, M.D. Leonard, coll.; Charles Schaeffer Collection; H.S. Barber Bequest, 1950.
1	Seneca VA, 20 mi. NW Wash. D.C., J.C. Bridwell, 6-V-39; 6 <i>punctata</i> HSB 39 (Oliv.).
1	Fredericksburg, Va.; Coll. Hubbard & Schwarz.
1	On <i>Carex</i> sp. leaves, Boothville, La., 3-5-45 12002.
7	Montg. Co., Md. VIII-30-10 [2 of these also have "Schoemaker Collection, 1956"].
3	Washington, D.C.; Charles Schaeffer Collection; H.S. Barber Bequest, 1950.
1	FLA. Miami, May 10-1969; C. Stegmaier, Swept ragweed.
9	MO., St. Louis Co., J.M. Sullivan; From <i>Commelina diffusa</i> [1 of these has "July 21, 1977," 4 have "July 7, 1983," 1 has "Aug. 1, 1983," 3 have "Aug. 8, 1983"].
4	On <i>Rubus</i> sp. foliage, Buras, La., III-8-45-6396.
3	With unidentified reed nr. roots, Boothville, La., 23-II-45-5604.

1 Esp. Rch., Brownsville, VII Tex.
 1 Montg. Co., Md., IX-3-07.

60 paratypes (UMRM unless otherwise indicated)

4 MO. Warrensburg, Wilbur R. Enns,
 VII-21-1961; Taken on *Desmodium*.
 2 Louisiana, MO., V-12-1974, W.S. Craig;
 WSC.
 4 Columbia, MO., V-16-1972, W.S. Craig;
 WSC. [One of these has a date of "VI-23-
 1972," 1 has V-12-1968.]
 2 Columbia Mo., Boone Co., 27 Apr. 74, Coll.
 E.G. Riley; Host *Commelina*.
 33 1 mi. E. Moberly, MO., Randolph Co.,
 E.G. Riley. [these specimens were taken
 during the years 1972-74 and on dates
 from April 27 to Aug. 1; some bear the
 datum "Host *Commelina*." Fifteen of 33 in
 USNM.]
 2 Jct. Crider Creek and A, Gasconage Co.,
 Mo., 15-Aug.-74, Coll. E.G. Riley.
 2 D.C.
 3 La.; [1 of these also has "N. Orleans; 4-5-
 94"].
 1 Penn.
 1 Ranken, Mo., St. Louis Co.; 6-9-465, E.P.
 Meiners.
 1 Mound City, Holt Co., Mo., V-4-17 1968;
 Malaise trap collecting.
 1 Wenzville, VII-2-1949, Mo., W.S. Craig; at
 light; 1525b, in LeC. Cab.; *Lema*
sexpunctata ephippium CAF1525b Lec.
 1 FLA: Highlands Co., Archbold Biol. Station,
 May 17, 1974; Blacklight: J.E. Carrel,
 D.D. Kopp, M.S. McLaughlin, R.D.
 Heathcote.
 2 Columbia, Mo., W.R. Enns, V-19-1940.
 1 Columbia, Mo., D. Eschenburg, N-16-1940.

6 paratypes (EGRC)

LA: E. Baton Rouge Par. Baton Rouge, Coll.
 E.G. Riley; on *Commelina virginica* L.,
 Commelinaceae [3 have collection date of
 VI-3-82 (1 in USNM); 1, VI-9-82; 1, VI-
 11-82; 1, VII-25-82.]

6 paratypes (OSUC unless otherwise indicated)

1 5-8-1901; Nashville, Tenn.; Coll. E.B.
 Williamson.
 2 Va.; H.W. Wenzel Collection [1 in USNM].
 3 Opelousas, 5-4 La.; H.W. Wenzel Collection
 [1 in USNM].

6 paratypes (CASC)

2	D.C.; Blaisdell Collection.
2	La.; Van Dyke Collection.
1	Fredericksburg, Virginia; Van Dyke Collection; 6575.
1	High Isl., 17 June.

13 paratypes (FSCA unless otherwise indicated)

1	Gainesville, Fla. 30-V-55; P.E. Frierson, Coll.; At Rosa; G.B. Merrill Det. 19; S.P.B. Acc. No. 121984; <i>Lema albini</i> Lac. Det. M.W. Sanderson 57.
2	Belle Glade, Palm Beach Co., Florida; W.G. Genung, 10-IV-79; <i>Helianthis</i> sp. [1 in USNM].
1	FLA.: Highlands Co., Archbold Biol. Sta., 4-X-1978, H.V. Weems, Jr. & Steven J. Chance, Insect Flight trap.
1	FLA.: Highlands Co., Archbold Biol. Sta., H.W. Weems, Jr. & Sylvia Halkin, Insect flight trap.
1	FLA.: Highlands Co., Archbold Biol. Sta., 5-VI-1978, H.V. Weems, Jr. & Lisa K. Klein, Insect flight trap.
2	FLA.: Glades Co., 1 mi. S. Palmdale, 6-IV-1972, J.B. Hepner Coll.
2	Miami, Fla. 27-IX-48; O.D. Link Coll.; at <i>Pisum</i> ; H.S. Barber det.; S.P.B. Acc. No. 101532; M.W. Sanderson Det. 1957.
1	College Park, MD. 5-26-48, B.K. Dozier; Sweeping weeds along Point Branch [in USNM].
1	Santa Rosa Co., Fla.; F.W. Mead Sta. 18; F.W. Mead Coll. 24-VII-55.
1	Hardee Co., FLA; R.H. Rhodes, 27-II-67; In Steiner trap.

12 paratypes (CNCI)

4	Newry, S.C., Oconee Co., 900', 7.VIII.1957, J.G. Chillcott.
1	Hurst, Ga., Fannin Co., 22.VIII.1957, J.G. Chillcott.
1	Lafayette Co., Miss. V VI. 1962.
1	Ill. Union Co. Pine Hills, nr. Pine Hills Cmpgr. 7.V.76.
5	FL. Liberty Co., Torreya St. Pk., 8.X.1980, 8023, Masner & Brown. [One differs from the 4 others in that it has "7.X.1980. 8022."]

Material Examined

I examined 156 specimens of *N. cordata*. Locations of their collection follow.

Arkansas—St. Charles. **District of Columbia**. **Florida**—Alachua Co.; Gainesville; Palm Bch. Co.; Santa Rosa Co.; Miami; Glades Co.; Highlands Co.; Liberty Co., Torreya St. Pk. **Georgia**—Hurst; Fannin Co. **Illinois**—Union Co. **Louisiana**—Baton Rouge; Opelousas; Buras; Toothville. **Maryland**—Glen Echo; Plummerville; Montgomery Co. **Mississippi**—Lafayette Co. **Missouri**—Columbia; Mound City, Holt Co.; 1 mi. E. Moberly, Randolph Co.; Louisiana; Warrensburg; Gasconade Co.; St. Louis, Co.; St. Charles Co. **Pennsylvania**—no locality given. **South Carolina**—Newry. **Alabama**—Coleta. **Tennessee**—Nashville. **Texas**—Brownsville. **Virginia**—Suffolk; Fredericksburg.

Distribution

The distribution of *N. cordata* is primarily in Southeastern United States but extends west to the Central States and Texas (fig. 73).

Hosts

Label data on hosts follow: On *Carex* leaves; swept ragweed; on *Rubus* sp. foliage; from *Commelina diffusa*; host *Commelina*; taken on *Desmodium*; on *Commelina virginica*; *Helianthus* sp.; at *Pisum*.

Remarks

It is surprising that a species as widely ranging and readily collected as this one could have gone unrecognized as distinct for so long. Doubtless the chief reason is that this taxon is readily confused with the taxon that has been known as *Lema sexpunctata albini*. In fact, *N. cordata* has been identified in most collections as *L. sexpunctata albini*. The latter is herein recognized as *Neolema sexpunctata* with an extreme variation in markings. See under *N. sexpunctata* for a discussion of *L. sexpunctata albini*. I examined the holotype of *albini* and have no doubt as to its identity.

In *N. cordata* the basal dark elytral spot virtually always extends to the scutellum; in just 1 of 79 USNM specimens does the spot approach but not quite reach the scutellum. In *N. sexpunctata* this elytral spot is never as close to the scutellum. In addition, the legs of *N. cordata* tend distinctly to be light basally. Such a coloration of the legs occurs also in *N. sexpunctata* but much less frequently. Another difference between these two species is that the elytral punctures are smaller and denser in *N. sexpunctata* than in *N. cordata*; also, the basal half of the third elytral stria has 10–14 punctures in *N. sexpunctata* but 8–10 punctures in *N. cordata*.

The USNM specimens determined as the widespread neotropical species *Lema dorsalis* look quite similar to *N. cordata*. However, I found much more variation in the dark markings of *L. dorsalis* than in those of *N. cordata*, and comparison of the male genitalia showed differences which indicate that *L. dorsalis* and *N. cordata* are probably distinct. The USNM has 800–900 specimens that either are or closely resemble *L. dorsalis*. Sorting out this series is a task for the future.

***Neolema ephippium*
Lacordaire**
(figs. 21, 81, 107)

Lema ephippium Lacordaire, 1845:483; Clark, 1866:34 (world catalog); Gemminger and Harold, 1874:3254 (world catalog); LeConte, 1849:34 (distribution); Balsbaugh and Hays, 1972:22 (taxonomy); Wilcox, 1974a:7 (N. Amer. checklist); Wilcox, 1974b:8 (Amer. checklist).
Lema ephippiata Lac.: Crotch, 1873b:94 (N. Amer. checklist); Henshaw, 1885:105 (N. Amer. checklist).
Lema sexpunctata ephippiata Lac.: Crotch, 1873a:26 (taxonomy); Ulke, 1902:27 (distribution).
Lema sexpunctata ephippium Lac.: Jacoby and Clavareau, 1904:15 (world catalog); Clavareau, 1913:79 (world catalog); Leng, 1920:287 (N. Amer. checklist); Blatchley, 1924:39 (distribution); Schaeffer, 1933:307 (in key); Blackwelder, 1939:61 (N. Amer. checklist); Löding, 1945:126 (distribution); Blackwelder, 1946:631 (Amer. checklist); Monros, 1960:216 (world checklist).

Diagnosis

Ninth elytral stria with a gap of 6–10 punctures; elytra with a large discal dark marking, sides of marking constricted; legs dark throughout.

Description

General. Body mostly orange red to red. Following are black to dark brown: Antennae, legs (except part of femora), humeral spots, most of elytral disk, (discal dark markings typically cover 5 intervals near base and 6 or 7 near apex), part of coxae, sides of mesosternum and metasternum. Dorsal body surfaces shiny; most ventral body surfaces moderately shiny.

Color Variation. Often 1st 1 or 2 antennal segments and sometimes apical segment partly red; clypeus usually black basally; discal dark marking often constricted at middle of elytra; infrequently, upper and lower parts of discal markings very narrowly joined; coxae may be entirely without dark markings, or procoxae and mesocoxae about 1/2 dark and metacoxae with a small portion dark.

Head. An antenna about 2/3 as long as body. Vertex with a distinct groove extending longitudinally nearly throughout, often deepest posteriorly; surface smooth, with minute, sparse punctation. Clypeus with minute punctation, each side also with small to moderate-sized punctation.

Pronotum. Anterior width subequal to basal width; constriction located below middle, width at constriction about 82%–86% of width near apex; surface smooth, with minute and small to moderate-sized punctation; larger punctures located medially in a longitudinal band within anterior 2/3 and anteriorly on each side; at basal 1/3, a transverse, curving depression.

Elytra. Punctures of striae very large but variable in size, not close; 3d stria with 7–10 punctures in basal 1/2; 9th elytral stria incomplete, with a gap of 6–10 punctures; surface smooth, no wrinkling, but with small punctures on intervals; disk clearly depressed above basal 1/3.

Ventral Surface. Metasternum with sparse, small to moderate-sized punctation, at middle often with fine wrinkling; sides sometimes minutely alutaceous. Abdomen with moderate-sized to small punctation, moderate in density; sides of segments alutaceous.

Length. Body 4.0–4.9 mm.

Aedeagus. In lateral view (fig. 107) widest medially, apical tip weakly inclined downward, upper apical margin convex.

Type

The holotype of *N. ephippium* is in BMNH and bears the data “TYPE; *Lema ephippium* Lacord.; Type; *Lema ephippium* Dej. in America bor.”

Material Examined

Only 17 specimens of *N. ephippium* were examined. The collection localities follow. **Florida**—Enterprise; Ft. Myers; Hialeah; St. Nicholas; Crescent City; Gainesville; Glades Co., 1 mi. S. Palmdale; Lake Co. **Louisiana**—no locality given.

Distribution

I have seen specimens from only Florida and Louisiana (fig. 81).

Hosts

A label gives the datum, on *Zebrina pendula*. Literature notes follow: On blossoms of thistle, on basswood (Blatchley 1924:39).

Remarks

Though this species has been placed as a subspecies of *N. sexpunctata* in the past, the two species are readily separated. The discal elytral dark markings are united in *N. ephippium* but not in *N. sexpunctata*; *N. ephippium* is 4.0–4.9 mm long whereas *N. sexpunctata* is 4.8–6.2 mm long; and the elytral punctures are smaller and denser in *N. sexpunctata*. Also the basal half of the third elytral stria has 10–14 punctures in *N. sexpunctata* but only 7–10 punctures in *N. ephippium*. Balsbaugh and Hays (1972:22) recorded this species from Houston Co., Alabama. I have seen no specimens from Alabama.

The color of the legs of *N. ephippium* and *N. ovalis* (primarily dark in *N. ephippium*, bicolored in *N. ovalis*) is the best character for distinguishing these very similar species. In addition, the dark elytral markings are more or less constricted medially in *N. ephippium* but are not or are weakly constricted in *N. ovalis*. *Neolema ephippium* was first published in the Dejean catalogs (Dejean, 1835:360, 1837b:387); the citations were nomina nuda.

Neolema gundlachiana
(Suffrian), New
Combination
(figs. 26, 74)

Lema intermedia Suffrian, 1866:287 (junior secondary homonym of *intermedia*, Guérin).

Lema gundlachiana Suffrian, 1874:152 (replacement for *intermedia* Suff.); Jacoby and Clavareau, 1904:24 (world catalog); Clavareau, 1913:65 (world catalog); Leng and Mutchler, 1914:451 (Amer. checklist); Blackwelder, 1946:630 (Amer. checklist); Monros, 1960:223 (world catalog).

Diagnosis

Elytra orange, with humeri, a basal spot, and a very large apical spot black.

Description

General. Most of head, prothorax, most of elytra, apex of mesosternum, base of metasternum, and abdomen orange; eyes black; clypeus and labrum black, most of remainder of mouthparts dark; elytra with humeri, a common spot behind scutellum, and most of apical 2/5 black; coxae and most of femora black, femora narrowly light near base; tibiae and tarsi brown; basal 4 segments of an antenna black, outer 7 segments brown basally, dark brown apically. Body surfaces shiny.

Color Variation. Humeral dark spots sometimes reduced; dark spot behind scutellum reduced to absent; apical elytral marking reduced (1 specimen), leaving extreme apex orange; base of femora may be broadly light.

Head. An antenna 2/3 as long as body, with segments 7–11 elongated, segment 7 just over 2 times as long as wide, segments 8–11 each about 2 times as long as wide. Vertex with a shallow, median depression; surface shiny, punctures variable in size. Clypeus shiny, with fine, moderately dense punctures.

Pronotum. Base and apex subequal in width, width greater than length; constriction submedian, weak, width at constriction about 94% of width near apex; in dorsal view anterior margin sinuate; moderate-sized punctures located medially in anterior 2/3 and anteriorly on each side; surface also with extremely fine punctation; at basal 1/4, a weak transverse depression with a distinct median pit.

Elytra. Feeble to no evidence of a basal transverse depression; surface between punctures of striae smooth, impunctate not grooved; 3d stria with 8–15 punctures in basal 1/2 of each elytron; 9th stria incomplete, with a gap of 7–10 punctures; elytra elongated, each elytron 3.2–3.4 times as long as wide.

Ventral Surface. Metasternum with fine setiferous punctation, moderate in density. Abdomen with fine, moderately dense punctation nearly throughout; medially at base of segment 1, punctation large, denser than elsewhere.

Length. Body 4.20–4.35 mm.

Type Material

The bulk of the Suffrian collection is in the Martin-Luther Universität, Halle, Germany. M. Dorn (Sektion Biowissenschaften) has informed me that the type of Suffrian's *L. intermedia* is not to be found there, so I do not know the location of the type.

Material Examined

The single North American specimen of *L. gundlachiana* I examined bears the label data "Florida, Dade County, Homestead, IFAS Exp. Sta., 9-XI-1973. W.H. Pierce. Malaise Trap."

Distribution

In the United States *N. gundlachiana* is known only from southern Florida (fig. 74).

Remarks

Most of the previous description is based on the single U.S. specimen; however, four additional specimens (two from Cuba, two from the Dominican Republic, all in USNM) were consulted, and indications of variation in various characters in the description and key are based on them.

Neolema gundlachiana is here newly recorded from North America.

***Neolema jacobina* Linell,
New Combination
(figs. 1, 53, 78, 103)**

Lema jacobina Linell, 1897:474; Jacoby and Clavareau, 1904:15 (world catalog); Clavareau, 1913:67 (world catalog); Leng, 1920:287 (N. Amer. checklist); Schaeffer, 1933:307 (in key); Blackwelder, 1939:61 (N. Amer. checklist); Monros, 1960:222 (world checklist); Kaufmann, 1967:363 (biology and larva); Balsbaugh and Hays, 1972:21 (taxonomy; actually *L. ovalis* White); Wilcox, 1974a:7 (N. Amer. checklist); Wilcox, 1974b:8 (Amer. checklist).

Diagnosis

Ninth elytral stria with a gap of 6–10 punctures; elytra entirely light or with a dark stripe on suture.

Description

General. Body pale orange to red orange nearly throughout, elytral suture often narrowly brown to partly or almost entirely black; antennae brown to black except basally; tibiae apically and tarsi more or less darkened; dorsal body surfaces shiny; ventral body surfaces moderately shiny.

Color Variation. Dark sutural stripe of elytra absent in about 1/2 the number of specimens examined.

Head. An antenna just over 1/2 as long as body; vertex with a median, weak longitudinal groove or, sometimes, shallow depression, also with small to moderate-sized punctation of moderate density; clypeus with small and moderate-sized punctation, moderate in density.

Pronotum. Anterior width subequal to basal width, width a little greater than length; constriction located a little below middle, width at constriction about 83%–85% of width near apex; surface with very small, generally sparse punctation; small to moderate-sized punctation present anteriorly along middle and anteriorly on each side; behind basal 1/3, a shallow, transverse depression with a small median pit.

Elytra. Punctures of striae large, not close; 3d stria with 8–10 punctures in basal 1/2; 9th stria with a gap of 7–10 punctures; interstriae usually with no small punctures, usually with fine wrinkling; disk with no to feeble indication of depression near base.

Ventral Surface. Metasternum with moderate-sized to small punctures of moderate density, but punctures nearly absent at middle. On abdomen, segment 1 with generally moderate-sized punctation, moderate in density, but with punctures smaller at sides; segments 2–5 with generally smaller punctures, punctures largest medially, smallest at sides, moderate in density; sides of segments sometimes alutaceous.

Length. Body 4.3–5.3 mm

Aedeagus. In lateral view (fig. 103) widest medially, apical tip weakly inclined downward, upper apical margin weakly convex; in dorsal view tip pointed, sides widest medially, orifice small and overlaid by 3 lobes; internal processes symmetrical from dorsal view, not in form of a human figure.

Type Material

The holotype (USNM) bears the data “S. Diego 26-5 Tex.; Type no. 1292 U.S.N.M.; *Lema jacobina* Linell.”

Material Examined

I examined only 18 specimens of *N. jacobina*. They are from the following localities. **Kansas**—Riley Co. **Missouri**—Columbia; Mound City; Louisiana. **Texas**—Victoria; Goliad; S. Diego; S. Antonio; Starr Co.

Distribution

Neolema jacobina occurs from Texas to Missouri and Kansas (fig. 78).

Hosts

The data from labels follow: Reared on *Commelina communis*; host *Commelina communis*. Kaufmann (1967:363) recorded *Commelina erecta* as a host.

Remarks

Neolema jacobina, which has at most only a narrow sutural stripe (fig. 1), is readily distinguished from its nearest relatives (*N. ephippium*, *N. ovalis*, *N. sexpunctata*, *N. quadriguttata*, *N. adunata*, and *N. cordata*) in that they always bear more extensive elytral dark markings. Just 4 of the 11 USNM specimens I examined lack a sutural stripe (see fig. 1a). The species most similar to *N. jacobina* is *N. ovalis*. In some specimens of *N. ovalis*, development of the dark elytral markings is weak enough (fig. 20a) as to approach the development typical for *N. jacobina* (fig. 1).

***Neolema ovalis* White,
New Species
(figs. 20, 74, 104)**

Diagnosis

Ninth elytral stria with a gap of 7–11 punctures; elytra with a large discal dark marking; legs with outer segments darkened.

Description

General. Head, 1st antennal segment, prothorax, sides of elytra, ventral surface, and most of legs yellow to orange to red orange. Following are black: Antennae (except basal segment), elytral disk (usually with bluish reflection), and part of tibiae and tarsi (tarsi may be all brown). Dorsal body surfaces shiny; ventral body surfaces moderately shiny.

Color Variation. Dark discal markings of elytra variable (see fig. 20); last antennal segment sometimes light; dark markings on tibiae at about apical 1/2 of tibiae, or at apex and along side, or at apex only; labrum and mandibles may be dark in part; tarsi usually dark with median portion of each segment light, but sometimes tarsi predominantly light.

Head. An antenna clearly over 1/2 as long as body; vertex with a short, shallow, longitudinal groove and with fine punctation of moderate density; clypeus with both fine and moderate-sized punctation.

Pronotum. Anterior width a little greater than basal width, width a little greater than length; constriction located a little below middle, width at constriction about 86% of width near apex; surface with fine and sparse punctures and with moderate-sized punctures on anterior of disk and on anterior of each side; near basal 1/3 with a shallow, transverse depression, usually with a median, shallow pit.

Elytra. Punctures of striae not close, 3d stria with 6–10 punctures in basal 1/2; 9th stria incomplete, with a gap of 7–11 punctures; interstriae with virtually no fine punctation; disk with feeble to no indication of a transverse depression at basal 1/4.

Ventral Surface. Metasternum with moderate-sized punctures of moderate density, least dense medially. Abdomen with fine to moderate-sized punctation, punctures largest medially on each sternite, first sternite nearly impunctate anteriorly near middle and anteriorly on each side; at sides of sternites, surface often alutaceous and with fine dense punctures.

Length. Body 4.2–5.3 mm.

Aedeagus. In lateral view (fig. 104) widest apically, apical tip weakly inclined downward, upper apical margin nearly straight; in dorsal view sides subparallel, orifice small, overlaid by 3 reduced lobes; internal processes in dorsal view asymmetrical.

Type Material

Complete label data for the type material are quoted below.

<i>Type material</i>	<i>Label data</i>
Male holotype, 1 paratype	Madera Cn., Pima Co., Arizona; Dr. (USNM) Lenczy [holotype with "11.8.71," paratype with "11.3.71"].
20 paratypes (USNM)	
1	Las Vegas HS, 12-8 NM; Hubbard & Schwarz Coll. <i>Lema n. sp. near aemula</i> Horn; 333.
1	Cliff Cave, Apr. 28/78; <i>epippiata</i> [sic] det. in Pergorade Coll. as Crotch Checklist #55562.
2	Riley Co. Ks., Popenoe. [One of these has "July," the other "Jun 1."]
3	UA-1958, 195; Patagonia, Sta. Cruz Co., VIII-9-1958, ARIZ. C. O'Brien 19.
2	Ill. Madison Co., July 21–83, J. Sullivan; From <i>Commelina communis</i> .
1	Green Valley, Pima Co., Arizona; Dr. Lenczy, 9.1971.

<i>Type material</i>	<i>Label data</i>
7	Columbia Mo., Boone Co., 26 June, '75, Coll. E.G. Riley.
3	Columbia Mo., 19 June '75, Coll. E.G. Riley.
58 paratypes (UMRM unless otherwise indicated)	
2	Jct. Crider Creek and A, Gasconade Co., MO., 15-Aug.-74, Coll. E.G. Riley.
2	Columbia, Mo., Boone Co., Coll. E.G. Riley; Host <i>Commelina communis</i> . [One of these has "19-June-74," the other "18-June-74."]
6	Columbia, MO., IX-4-1985, W.S. Craig; On dayflower. [One differs from the others in the date "VI-16-1970," and having no host data.]
48	Columbia, MO., Coll. E.G. Riley; Host <i>Commelina communis</i> . [Collection dates from 25 May to Aug. 14, 1974 (33 in UMRM; 15 in USNM).]
1 paratype (NMDC)	IN.; Tippecanoe Co., VI-7-1982, N.M. Downie.
1 paratype (CASC)	Huachuca Mts., IX-18-1935, Ariz.; F.H. Parker.
1 paratype (CASC)	ARIZ. Santa Cruz Co., Yank's Spring, Sycamore Canyon, Tumacacori Mts., 4000'; 27.VII.1965, collector Hugh B. Leech.
1 paratype (OSUC)	Davis Mts., VII-3-55. Tex.; D.J. & J.N. Knull Collrs.
1 paratype (OSUC)	Patagonia M. VIII-2-53. Ar.; D.J. & J.N. Knull Collrs.
11 paratypes (FSCA unless otherwise indicated)	
5	Arizona, Huachuca Mts., Sunnyside, July 16, 1974, K. Stephan leg [2 in USNM].
2	Arizona, Huachuca Mts., Bear Cyn., Aug. 25, 1975, K. Stephan leg.
1	Arizona; Pajarito Mts., Pena Blanca Cyn., Aug. 15, 1971, K. Stephan leg.
1	Arizona; Santa Rita Mts., Madera Cyn. July 21, 1968.

Type material

Label data

- | | |
|---|--|
| 1 | Arizona, Pajarito Mts. Pena Blanca Cyn. 13 July 1970, K. Stephan coll. |
| 1 | Arizona, Pima Co., Arivaca Dec. 21 1969, K. Stephan leg. |

5 paratypes (EGRC unless otherwise indicated)

- | | |
|---|--|
| 4 | Columbia, MO., Boone Co., Coll. E.G. Riley; Host <i>Commelina communis</i> . [Dates 22–May–75 (in USNM); 29–May–75; July 75; 5 June 79.] |
| 1 | Carter Co., MO., Big Springs nr. Van Buren, 22 July 1978, E.G. Riley. |

Material Examined

The 101 specimens I examined were collected in the following locations.

Arizona—Patagonia, Santa Cruz Co., Tumacacori Mts.; Huachuca Mts.; Patagonia Mts.; Santa Rita Mts.; Pima Co.; Pajarito Mts. **Illinois**—Madison Co. **Indiana**—Tippecanoe Co. **Kansas**—Riley Co. **Missouri**—St. Louis; Mound City; Gasconade Co.; Columbia; 1 mi. E. Moberly, Randolph Co.; Louisiana. **New Mexico**—Las Vegas; HS. **Texas**—Davis Mts.

Distribution

Neolema ovalis occurs from Arizona and Texas diagonally to Indiana (fig. 74).

Hosts

Label data follow: On wandering jew; Malaise trap collecting; host *Commelina communis*; on day flower; water cress.

Remarks

I was unable to locate “Pajarito Mts., Ariz.” I have found “Pajarito” used for place names in New Mexico but not in Arizona.

A CASC specimen of *N. ovalis* is labeled as the type of *Lema aemula* Horn, “B var.” The specimen is from Sierra, San Lazarto, lower California. Horn never actually applied a name to this category (Horn 1894:406), so this specimen has no standing as a type.

The “*Lema jacobina* Linell” in Balsbaugh and Hays (1972:21) is, I suspect, actually *N. ovalis*. The part of the description that states “elytra with margins broadly orange, disc blue-black” is most convincing. The specimens Balsbaugh and Hays examined were collected in Cleburne and Madison Counties, Alabama; if the specimens are actually *N. ovalis*, then they represent a notable expansion of the range of this species.

Neolema jacobina is most similar to *N. ovalis*. Specimens of the latter with the least development of dark elytral markings approach typical *N. jacobina* in appearance.

Neolema quadriguttata
White, New Species
(figs. 23, 83)

Diagnosis

Elytral disk with 4 black spots, rarely an additional spot on humerus; 3d stria with 6–11 punctures on basal 1/2; length 4.0–4.7 mm.

Description

General. Mostly orange red to red. Following parts black: Most of antennae, 2 spots on each elytron (1 spot near basal 1/3, a larger spot near apex), most to part of legs, sides of mesosternum and metasternum, sometimes part of abdomen. Dorsal body surfaces shiny, ventral body surfaces moderately shiny.

Color Variation. Basal 2 antennal segments usually red in part, sometimes entire antenna red brown; tibiae and tarsi all to mostly black to dark; femora usually reddish basally, profemora and mesofemora usually dark dorsally below apex, metafemora usually black at about apical 1/2.

Head. An antenna about 3/5 as long as body; vertex with a medial, short longitudinal groove, also with minute to small punctures; clypeus with small punctures.

Pronotum. Anterior width subequal to basal width; constriction located a little below middle width at constriction about 83%–90% of width near apex; surface with minute and small punctures, small punctures located medially from anterior to middle and also anteriorly on each side; at basal 1/3, a shallow, transverse, curving depression.

Elytra. Punctures of striae very large, not close, 3d stria with 7–11 punctures in basal 1/2; 9th elytral stria incomplete, with a gap of 5–8 punctures; surface with minute punctures and no wrinkling; disk with a distinct, nearly round depression before basal 1/3, depression black.

Ventral Surface. Metasternum with fine punctation of moderate density, most sparse near middle; surface nearly smooth, sometimes weakly alutaceous at sides. Abdomen with generally moderate-sized punctation, moderate in density to dense, but often with small punctation laterally; sides of segments often alutaceous, feebly shiny.

Length. Body 4.0–4.7 mm.

Type Material

I have examined only 15 specimens of *N. quadriguttata*, all from Texas. Complete, quoted label data for the specimens follow.

Type material

Label data

Male holotype (USNM)

San Antonio, Texas, Coll. Hubbard & Schwarz.

5 paratypes (in USNM)

1

Victoria, 6 IV, Texas, E.A. Schwarz
Collector.

<i>Type material</i>	<i>Label data</i>
2	Texas, Charles Schaeffer Collection.
1	San Diego, Texas, 9–12, Collectors Hubbard & Schwarz.
1	Columbus, Texas, 21–8, Hubbard & Schwarz.
1 paratype (in CNCI)	Lost Pines Pk., Bastrop, Texas, April 8, 1959, W.R.M. Mason.
8 paratypes (TAMU unless otherwise indicated)	
2	TEXAS: Anderson Co., Salmon; April 28–May 16, 1975 [but 1 with date of April 26–27, 1975]; Malaise trap, H.R. Burke.
1	TEXAS: Salmon, Anderson Co., Oct. 20, 1974, H.R. Burke; Taken from malaise trap [in USNM].
1	Palmetto St. Pk., Gonzales Co., Tex., April 3, 1969, Veryl V. Board.
1	TEXAS: Brazos Co., near College Station, TAMU Range Sci. Area. July 2, 1978, Berlese-leaf litter, S.J. Merritt.
1	Goose Island St. Park, Aransas Co., Texas, June 26, 1969, Board Hafernik.
1	Palmetto State Park, Gonzales Co., Texas, May 4, 1970, Board & Schaffner [USNM].
1	Texas, Tyler Co., 3 km. S. Warren, March 31, 1979, R.S. Peigler [USNM].

Distribution

Neolema quadriguttata is known only from southeastern Texas (fig. 83).

Remarks

Neolema quadriguttata is closely related to *N. sexpunctata*, but the two species are easily separated. *Neolema quadriguttata* is 4.0–4.7 mm long and usually has no humeral dark spot (one specimen has weak humeral spots, one specimen has distinct humeral spots). *Neolema sexpunctata* is 4.8–6.2 mm long and does have humeral dark spots. Elytral punctures of the striae are larger and less dense in *N. quadriguttata* than in *N. sexpunctata*. Punctures at the basal half of the third elytral stria number 7–11 in *N. quadriguttata* and 10–14 in *N. sexpunctata*. Punctures at the elytral side may be in poor alignment in *N. quadriguttata* but are in good alignment in *N. sexpunctata*. The two species also differ in distribution: *N. sexpunctata* occurs nearly throughout Eastern United States to Louisiana and Arkansas, while *N. quadriguttata* evidently occurs just in southeastern Texas.

Neolema sexpunctata
(Olivier)
(figs. 25, 52, 79, 105)

Crioceris sexpunctata Olivier, 1808:738.
Lema sexpunctata (Olivier), Dejean, 1835:360 (world checklist); Dejean, 1837b:386 (world checklist); Lacordaire, 1845:486 (taxonomy); LeConte, 1849:34 (distribution); Clark, 1866:34 (world catalog); Crotch, 1873b:94 (N.

Amer. checklist); Crotch, 1873a:26 (taxonomy); Gemminger and Harold, 1874:3260 (world catalog); Townsend, 1885:71 (distribution); Henshaw, 1885:105 (N. Amer. checklist); Jacoby, 1888:32 (taxonomy); Ulke, 1902:27 (distribution); Jacoby and Clavareau, 1904:15 (world catalog); Clavareau, 1913:79 (world catalog); Dozier, 1918:370 (distribution); Leng, 1920:287 (N. Amer. checklist); Dozier, 1922:117 (distribution); Brisley, 1928:117 (in key); Schaeffer, 1933:307 (in key); Brimley, 1938:221 (distribution); Green, 1939:128 (biology); Blackwelder, 1939:61 (N. Amer. checklist); Malkin, 1941:212 (distribution); Sailsbury, 1943a:73 (larval morphology); Sailsbury, 1943b:128 (larval morphology, key); Hughes, 1944:130 (distribution); Malkin, 1945:104 (distribution); Löding, 1945:126 (distribution); Blackwelder, 1946:631 (Amer. checklist); Fattig, 1948:5 (distribution); Wilcox, 1954:377 (taxonomy); Peterson, 1957:77 (larval morphology); Monros, 1960:216 (world checklist); Kaufmann, 1967:363 (larval key); Balsbaugh and Hays, 1972:22 (taxonomy); Wilcox, 1974a:7 (N. Amer. checklist); Wilcox, 1974b:8 (Amer. checklist); Wilcox, 1979:10 (hosts). *Crioceris sexmaculata* Germar, 1824:526; Monros, 1960:217 (world catalog). *Lema albini* Lacordaire, 1845:492 (taxonomy, biology); Clark, 1866:34 (world catalog); Gemminger and Harold, 1874:3250 (world catalog); Crotch, 1873b:94 (N. Amer. checklist); Blatchley, 1910:1111 (taxonomy); Balsbaugh and Hays, 1972:22 (taxonomy); Wilcox, 1974a:7 (N. Amer. checklist); Wilcox, 1974b:8 (Amer. checklist). New Synonymy. *Lema sexpunctata albini* Lac.: Crotch, 1873b:26 (taxonomy); Henshaw, 1885:105 (N. Amer. checklist); Castle and Laurent, 1896:304 (distribution); Jacoby and Clavareau, 1904:15 (world catalog); Clavareau, 1913:79 (world catalog); Leng, 1920:287 (N. Amer. checklist); Blatchley, 1924:39 (distribution); Schaeffer, 1933:307 (in key); Brimley, 1938:221 (distribution); Hughes, 1944:130 (distribution); Löding, 1945:126 (distribution); Blackwelder, 1946:631 (Amer. checklist); Fattig, 1948:5 (distribution); Monros, 1960:216 (world checklist).

Diagnosis

Elytral disk with 4 black spots, also a spot on each humerus; adjacent discal spots often join at suture; 3d stria with 10–14 punctures in basal 1/2; length 4.8–6.2 mm.

Description

General. Predominantly orange red to red. Following parts black: Antennae, 3 spots on each elytron (humeral spot smallest and near basal 1/3, preapical spot largest), legs (except coxae in part and base of femora), sides of mesosternum and metasternum, 1st abdominal segment at side. Dorsal body surfaces shiny; ventral body surfaces moderately shiny.

Color Variation. Basal 2 antennal segments often red in part, infrequently red nearly throughout; clypeus usually more or less dark; extent of light markings at base of femora variable; dark marking at side of 1st abdominal segment variable in extent.

Head. An antenna about 3/5 as long as body; vertex with a medial, short longitudinal depression, also with sparse, minute to small punctures (fig. 52); clypeus with minute and small punctation.

Pronotum. Anterior width subequal to basal width; constriction located a little below middle, width at constriction about 77%-80% of width near apex; surface with minute and small punctures, small punctures located anteriorly along middle and anteriorly on each side; at basal 1/3, a shallow, transverse, curving depression.

Elytra. Punctures of striae large, not close, 3d stria with 10–14 punctures in basal 1/2; 9th stria incomplete, with gap of 8–11 punctures; surface with minute punctation and no or minute wrinkling; disk with distinct, black depression above basal 1/3.

Ventral Surface. Metasternum with fine punctation, moderate in density, most sparse near middle; surface nearly smooth but with fine wrinkling near middle. Abdomen with generally moderate-sized punctation, moderate in density to dense; sides of segments minutely alutaceous.

Length. Body 4.8–6.2 mm.

Aedeagus. In lateral view (fig. 105) widest medially, apical tip weakly inclined downward, upper apical margin weakly convex; in dorsal view sides weakly narrowed anteriorly, orifice overlaid by 3 lobes; internal processes in dorsal view symmetrical, form of a broad human figure.

Type Material

The holotype of *N. sexpunctata* (BMNH) bears the data "Type; E. Coll. Chev.; *Lema sexpunctata* Olivier, America bor. ex. mus. Olivier; *Lema sexpunctata* Oliv. type."

Material Examined

A total of 1,503 specimens was examined. The collection localities follow.

Alabama—Mobile; Birmingham; Selma; Decatur. **Arkansas**—Texarkana; Washington Co. **Delaware**—Wilmington. **District of Columbia**—Oxen Run; Rock Creek Park. **Florida**—Key Largo; Orange Co.; Orlando; Highlands Co.; Gainesville; Apopka, Jackson Co.; Clariston. **Georgia**—Athens. **Kentucky**—Cazier; Powell Co. **Louisiana**—Covington; New Iberia; Baton Rouge; Buras; Venice; Boothville; Oliver; Sunshine; Lafourche Par.; Opelousas. **Maryland**—Rockville; Glen Echo; Plummers Is.; Anne Arundel Co.; Hancock; Hyattsville; Montgomery Co.; Williamsport; Ellicott City; Chesapeake Bch.; Forest Glen; Baltimore; College Park. **Mississippi**—Gulfport; Natchez. **Missouri**—St. Louis Co.; Gasconade Co.; Columbia; Ste. Genevieve (7 mi. S.); Flourissant; Osage Co. **New Jersey**—Bridgeboro; Moorestown; Haddon Hts. **North Carolina**—Bryson City; Raleigh; Valle Crucis; Hendersonville; Earlton; Lake Junaluska; Charlotte; Faison. **Ohio**—Hocking Co.; Adams Co. **Pennsylvania**—Conewago; Upper Darby; York Co.; 5 mi. W. Davidsburg; Enola; Lancaster Co.; Broomall. **South Carolina**—Newberry; Clemson Coll. **Tennessee**—Great Smoky Mts.; Greenbriar; Elmwood. **Texas**—Columbus. **Virginia**—Rosslyn; Suffolk; Lake Drummond; Glenclaryn; Falls Church; Vienna Vall.; Alexandria; Alexandria Co.; Great Falls; Fauquier Co.; Richmond; Fredericksburg.

Distribution

Neolema sexpunctata occurs in Southeastern United States to Texas and Pennsylvania (fig. 79).

Hosts

Label data follow: Bred from *Commelina nudiflora*; bred from *Commelina virginica*; *Commelina communis*, on snapbean leaf; on *Festuca* sp. (grass); on avocado leaves; host *Commelina communis*; *Philodendron panduraeforme*; *Zebrina* sp.; host *Commelina*; on *Sesbania macrocarpa*; reared from wandering jew; on *Polygonum* sp. Wilcox (1979:10) recorded the hosts as "*Commelina erecta*, dayflower; *Tradescantia virginiana* L., spiderwort."

Remarks

A series of 504 specimens (R.E. White collection, included in the above total of 1,503 specimens) was collected from a large patch of *Commelina communis* at a shaded roadside in Anne Arundel Co., Maryland, by R.E. and Jan White in eight different visits from June 29, 1968, to September 14, 1968. The nature of this series (along with other data) has led me to synonymize *N. albini* with *N. sexpunctata*. *Neolema albini* supposedly differs from *N. sexpunctata* in that the discal elytral dark spots are joined in *N. albini* and not joined in *N. sexpunctata*. On this basis 71 specimens are assignable to *N. albini* while the other 433 specimens are assignable to *N. sexpunctata*. The situation is similar with other lengthy series of specimens with identical collection data: a portion of such series consists of specimens assignable to *N. albini*. If *N. albini* and *N. sexpunctata* were actually distinct species with differing biologies and habits, it is very unlikely that they would be collected together so frequently. I mapped the distribution of specimens assignable to *N. albini* and found that it almost exactly matches the distribution of specimens assignable to *N. sexpunctata*. Also, there is no clear gap between specimens with elytral dark spots that are joined and those with spots that are separate. Instead, numerous specimens exhibit elytral markings that form a continuum ranging from joined spots to separate spots. I made separate lists of the localities in which *N. sexpunctata* and specimens assignable to *N. albini* had been collected. On my lists were 53 separate localities for *N. albini* (89 for *N. sexpunctata*). Of these 53 only 5 were unique for *N. albini* and, thus, were not also on the list for *N. sexpunctata*. I conclude that the name *N. albini* applies to just a color form of *N. sexpunctata*.

For a discussion of the characters that distinguish *N. sexpunctata* from the very similar *N. cordata*, see under the latter.

Wilcox, (1974b:8) listed *hexastigma* Lacordaire and *scutaria* Jacoby as synonyms of *sexpunctata*. I have seen the holotype bearing the species name *hexastigma* and am convinced that it deserves species status, so *hexastigma* is not included in the synonymy above. I have revalidated *Lema hexastigma* elsewhere with inclusion of *scutaria* as a synonym (White 1991:270).

The name *sexmaculata* (Germar) has for many years been carried in the synonymy of *N. sexpunctata*. The original description of *C. sexmaculata* includes the statement "Habitat in America septentrionali." Since this name applies to a North American species, it remains in the synonymy of *N. sexpunctata*.

There is a BMNH specimen that I take to be the holotype of *L. albini*. Its label bears the data "Type; 67.56; *Lema albini* Chevrolat 106 Type *L. enifaina*, N. Orleans D. Albin; *Lema albini* Lacord. type."

Oulema Des Gozis

Oulema Des Gozis, 1886:33; Clavareau, 1913:53; Lucas, 1920:468; Heinze, 1929:289; Blackwelder, 1946:628; Monros, 1960:175; Gressitt and Kimoto, 1961:75; Chujo, 1964:257; Wilcox, 1974a:6; Wilcox, 1974b:14; Kimoto and Gressitt, 1979:215; Seeno and Wilcox, 1982:28; Mohr, 1985:245. Type species, *Oulema melanopus* (L.).

Ulema Bedel, 1889:116, misspelling.

Hapsidolema Heinze, 1927a:162. Type species, *Lema lichenis* Voet.

Incisophthalma Heinze, 1929:289. Type species, *Lema infima* Lacordaire.

Xoidolema Heinze, 1931:206. Type species, *Xoidolema rhodesiana* Heinze.

Conradsia Pic, 1936:10. Type species, *Conradsia suturalis* Pic.

Parhapsidolema Monros, 1951:472 (subgenus). Type species, *Lema dilochosoma* Monros.

Hapsidolemoides Monros, 1951:470 (subgenus). Type species, *Lema bosqui* Monros.

Gracilema Chujo, 1964:257 (subgenus). Type species, *Oulema iwatai* Chujo.

Diagnosis

Antennal tubercles meeting or very close, much more close to one another than are frons and vertex. Prothoracic constriction moderate to weak, submedian to basal. Elytra usually dark throughout, rarely light with dark spots or stripes; punctures small to moderate in size, well aligned; 9th stria usually complete, sometimes with a gap (of 1–8 punctures). Aedeagus in lateral view broad, widest medially, sometimes widest basally, apical margin concave or sinuate; in dorsal view usually with 3 lobes clearly visible, infrequently median lobe overlaid with lateral lobes, internal processes of various forms.

Description

General

Body length 2.7–6.5 mm. Usually elytra entirely dark (18 species of 20) and pronotum red to orange (18 species of 20), rest of body variable in color.

Head

An antenna less than 1/2 as long as body to clearly more than 1/2 as long as body, segments often more or less expanded apically; interocular area not produced to distinctly produced each side of middle; frontal grooves distinct, forming an X; eyes more or less weakly notched, notch extending about 25% to about 40% of width of eye; head moderately constricted behind eyes.

Pronotum

Width about equal to length; sides more or less weakly constricted, constriction submedian to nearly basal; surface usually smooth, shiny; punctures moderate sized to large, located along midline to near base and along anterior on each side; surface sometimes with fine, dense punctation also.

Elytra

Each elytron with 10 striae of small to large punctures; punctures clearly aligned, smaller apically, sutural stria absent; elytral length about 1.6–1.8 times width.

Ventral surface

Tarsal claws touching basally.

Remarks

There is no universal agreement as to whether *Oulema* is a genus or subgenus. For example, Mohr (1985:244) placed *Oulema* as a subgenus of *Lema*, indicating the following to be the chief differences between the two subgenera: *Oulema*—front of head between eyes short, broader than long, sides forming an angle greater than 90 degrees; *Lema*—front of head between eyes not short, not broader than long, sides forming an angle less than 90 degrees.

Species Groups of *Oulema*

Similarity of color pattern on the dorsum effectively shows relationships in *Lema*, but few species of *Oulema* bear a color pattern. Other features must be used in forming species groups: the form of the head, antennae, pronotum (and pronotal punctation), and legs.

As with the grouping of the species of *Lema*, the grouping below is not intended to be phylogenetic.

Oulema concolor and *O. margineimpressa* share the character of being dark throughout, both also have a more or less bluish reflection of body surfaces.

The species *O. cornuta*, *O. simulans*, and *O. variabilis* show a number of significant similarities: Pronotal shape, color pattern (elytra dark, remainder of body nearly entirely light), enlarged hind femora (least enlarged in *O. variabilis*). In both *O. cornuta* and *O. simulans*, the vertex is more or less produced on each side of the midline.

I group together *O. collaris*, *O. longipennis*, *O. laticollis*, *O. elongata*, *O. melanopus*, and *O. melanoventris*, although there is more variation in characters than is ideal for a species group. The species *O. collaris*, *O. longipennis*, and *O. laticollis* show clear similarities in color (only prothorax light colored) and antennal form (outer segments enlarged). The elytra of *O. collaris* and *O. longipennis* generally show a blue reflection, but those of *O. laticollis* do not. The species *O. collaris* and *O. longipennis* are so similar that they can be difficult to distinguish. *Oulema elongata* and *O. melanopus* are added to this group for convenience as much as for any reason. The shape of the prothorax of *O. elongata* is similar to that of the first three species listed above; however, the prothoracic shape of *O. melanopus* is unique. The color of *O. elongata* (elytra, abdomen, tarsi, and tibiae in part dark) is unique as is also that of *O. melanopus* (primarily dark but with prothorax and most of legs light). The combination of characters shown by *O. melanoventris*, especially the elongated and slender antennae, makes this species unique also.

The two species *O. arizonae* and *O. sayi* show so many similarities that they are best placed by themselves, but they are clearly allied to the *O. cornuta* group. *Oulema arizonae* and *O. sayi* have dark elytra and legs, but most of the other body parts are light. The antennae are elongated and slender, and the pronotal shapes are similar.

The smallest species, *O. maculicollis* and *O. minuta* (2.7–4.0 mm), form the next group. The chief character that they share is a relatively elongated and densely punctate prothorax. They are dissimilar in that just the prothorax and most of the head of *O. maculicollis* are light, while the prothorax, head, and ventral surface of *O. minuta* are light.

The last group consists of *O. palustris*, *O. brunnicollis*, and *O. texana*, three species that are quite similar in many characters. The most distinctive character they share is the presence of strongly developed tubercles on the vertex. Outer antennal segments are enlarged, and the color of the ventral surface and legs is variable; the legs are generally light in *O. texana* but generally dark in the other two species. The prothoraces of these species are similar in shape.

There remains one species that cannot be placed in any of the above species groups. *Oulema colescens* is unique among the North American species of *Oulema* in that it bears elytral vittae and also in that its nearest relatives are in Central America.

Aedeagi

The aedeagi of the species of *Oulema* indicate that the species are more cohesive than are the species here placed in *Lema*. The aedeagi of *Lema* are essentially of two different forms, whereas the aedeagi of *Oulema* are essentially of one form. In lateral view of the aedeagus of *Oulema*, the widest point is generally median, and the tip is straight or (usually) inclined downward. In dorsal view three lobes overlie the orifice. Formwise, the most aberrant aedeagus is that of *O. maculicollis* (fig. 115).

Key to Species of *Oulema*

1. Pronotum very dark to black throughout, usually with a blue reflection2
- Pronotum red, orange, or yellow, sometimes black or dark in part3
- 2(1). Abdominal segments densely punctate medially; body length 4.0–4.5 mm (fig. 29); New Mexico and Arizona *concolor* (LeC.)
- Abdominal segments not densely punctate medially; body length 4.5–5.2 mm (fig. 28); Arizona *marginempressa* Sch.
- 3(1). Elytra bicolored, orange with 3 black stripes (fig. 27) *colescens*, n. sp.
- Elytra unicolorous, not as above4
- 4(3). Head moderately to distinctly bituberculate between eyes (figs. 56–65)5
- Head not at all or weakly tuberculate (figs. 54–55)10
- 5(4). Head distinctly bituberculate (figs. 58–65); body length 3.7–5.1 mm6
- Head moderately bituberculate (figs. 56–57); body length 4.5–6.2 mm9
- 6(5). Labrum, adjacent clypeus, femoral apices, tibiae, and tarsi dark; body length 4.5–6.2 mm *cornuta* (Fab.)
- Color not as above; body length 3.7–5.1 mm7
- 7(6). Legs primarily orange to red, tarsi often dark; body length 3.7–4.3 mm (fig. 42); Louisiana and Iowa to Colorado *texana* Crotch

	Legs primarily very dark reddish to black; body length 3.7–5.1 mm; Eastern to Central United States Texas	8
8(7).	Head moderately punctate, shiny; interocular tubercles large, prominent (figs. 62–63); pronotal punctation along midline and anterior at sides usually small, not dense; body length 3.7–4.6 mm (fig. 44); Eastern to Central United States and Texas <i>palustris</i> Blatchley Head weakly punctate, alutaceous, not shiny; interocular tubercles small, not prominent (figs. 58–59); pronotal puncta- tion along midline and anterior at sides large, dense; body length 4.2–5.1 mm (fig. 45); Florida and Alabama	<i>brunnicollis</i> Lac.
9(5).	Femora orange to red and with apices and remainder of legs black (fig. 40); Maryland to Florida to Louisiana <i>cornuta</i> (Fab.) Femora entirely orange to red, base of tibiae orange to red with remainder of legs black (fig. 35); Illinois and Louisiana to Texas	<i>simulans</i> Sch.
10(4).	Very small, length 2.7–3.3 mm; antennae red (fig. 36); Florida <i>minuta</i> , n. sp. Larger, length 3.2–6.3 mm; antennae usually black; various localities	11
11(10).	Femora all to mostly orange to red 12 Femora very dark reddish to black throughout..... 15	
12(11).	Ventral surface orange to red throughout (fig. 34); Texas <i>variabilis</i> , n. sp. Ventral surface all or mostly black; various localities	13
13(12).	Ninth elytral stria interrupted by a gap of about 7 punctures; 5th antennal segment about 3 times as long as wide (fig. 43) British Columbia <i>melanoventris</i> , n. sp. Ninth elytral stria not interrupted by a gap; 5th antennal segment 1 to 2 times as long as wide; Northeastern and Central United States including Texas and Louisiana	14
14(15).	Tibiae black; prosternum red or orange; 5th antennal segment a little longer than wide (fig. 33); Louisiana and Texas <i>elongata</i> , n. sp. Tibiae orange to red with apices black; prosternum black; 5th antennal segment about 2 times as long as wide (fig. 38); Northeastern to Central United States	<i>melanopus</i> (L.)
15(11).	Ventral surface orange to red throughout..... 16 Ventral surface black to mostly black, sometimes very dark reddish	17

- 16(15). Ninth elytral stria with a gap of 3–8 punctures; pronotum punctate (fig. 30); Maryland and Ohio to Florida and Texas *sayi* Crotch
Ninth elytral stria complete, rarely with a gap of 1–4 punctures; pronotum smooth (fig. 32); Arizona *arizonae* Sch.
- 17(15). Pronotum elongated, a little longer than wide; body length 3.2–4.2 mm (fig. 39); Florida to Oklahoma *maculicollis* Lac.
Pronotum less elongated, wider than long to as wide as long; body length 3.9–6.3 mm; various localities 18
- 18(17). Occurring in central Florida; pronotum distinctly widest anteriorly, sides clearly bulging; body length 5.3–6.2 mm (fig. 41) *laticollis*, n.sp.
Occurring from Ohio to Florida to Texas and Colorado; pronotum not as above, weakly bulging anteriorly at sides; body length 3.9–6.4 mm 19
- 19(18). Usually longer, 4.5–6.3 mm; elytra more elongated, 1.8–2.0 times as long as width at humeri (fig. 31); Colorado and Texas to Illinois *longipennis* Linell
Usually shorter, 3.9–5.3 mm; elytra less elongated, 1.66–1.80 times as long as width at humeri (fig. 37); Colorado to Ohio to Florida *collaris* Say

Oulema arizonae
(Schaeffer)
(figs. 32, 82, 108)

Lema arizonae Schaeffer, 1920:320; Leng, 1927:44 (N. Amer. checklist);
Brisley, 1928:117 (in key); Blackwelder, 1939:60 (N. Amer. checklist);
Wilcox, 1974a:7 (N. Amer. checklist); Wilcox, 1974b:8 (Amer. checklist).
Oulema arizonae (Schaeffer), Monros, 1960:229 (world checklist).

Diagnosis

Pronotum red or orange; elytra unicolorous; head not bituberculate between eyes; legs dark brown to black throughout; ventral surface orange to red throughout; Arizona.

Description

General. Most of head, all of prothorax, and ventral surfaces (including coxae) orange to red orange; clypeus, labrum, mandibles, antennae, legs, and elytra black to dark brown; elytra usually with a bluish reflection; body surfaces shiny to moderately shiny throughout.

Color Variation. Head may be dark ventrally adjacent to mouthparts, depression on frons sometimes darkened; elytra sometimes with purplish reflection; coxae sometimes dark in part; mesosternal and metasternal side pieces may be darkened.

Head. An antenna a little over 1/2 as long as body; outer antennal segments elongated, segments 7–10 each nearly 2 times as long as wide, 11th segment 2 times as long as wide. Vertex with a shallow, median, elongated depression and with fine punctation, moderate in density; surface of each side moderately convex. Clypeus with fine punctation, moderate in density.

Pronotum. Base and apex equal in width, width a little greater than length; constriction submedian, width at constriction about 90% of width near apex; surface punctation fine and sparse but irregular in size, usually with a median band of larger punctures within basal 2/3; basal transverse depression shallow and arcuate; within basal 1/3, a small, shallow, median pit.

Elytra. No evidence of a basal transverse depression; 3d stria with 12–16 punctures in basal 1/2 of elytron; 9th stria complete or with a gap of up to 4 punctures; surface between striae smooth, with no punctures and with feeble development of transverse grooves; elytra elongated, an elytron about 3.3 times as long as wide.

Ventral Surface. Metasternum with moderate-sized punctation, generally moderate in density, most sparse medially, most dense anteriorly on each side; abdomen with moderate-sized punctures of moderate density, less dense medially on 1st segment.

Length. Body 4.9–5.8 mm.

Aedeagus. In lateral view (fig. 108) widest medially, apical tip weakly inclined downward, upper apical margin convex; in dorsal view sides subparallel, 3 lobes overlie orifice, median lobe arcuate; internal processes in lateral view appearing spiraled, in dorsal view asymmetrical.

Type Material

The holotype of *O. arizonae* is USNM No. 42404, and its label bears the data “Type; Huach. Mts. Ariz; *Lema arizonae* Schffr.; Brooklyn Museum Coll. 1929; USNM Type No. 42404; *Lema arizonae* Schffr.”

Material Examined

I examined 20 specimens. The collection locations follow. **Arizona**—Huachuca Mts.; Douglas; 2 mi. SW Patagonia; San Bernadino Ranch, Cochise Co.; Patagonia; Pajarito Mts.; Santa Rita Mts.; Pima Co.; Chiricahua Mts.

Distribution

Oulema arizonae is known only from the extreme southeast corner of Arizona (fig. 82).

Hosts

Label data follow: Larvae in flower sheath of *Commelina erecta*; *Senecio salignus*.

Remarks

I have not located “Pajarito Mts.” in Arizona. I have found “Pajarito” in use for place names in New Mexico. Some labels state that the collection site was “Pajarito Mts., Pena Blanca Cyn.” I did find on a map of Arizona “Pena Blanca Rec. Area” northwest of Nogales, and that may have been the area of collection.

The specimens differ slightly in color. In fewer than half of the specimens, melanism of the elytra is somewhat reduced, and reddish to brownish tones show through the normally dark elytra.

Oulema arizonae and *O. sayi* are markedly similar in most morphological and color characters. In addition to the elytral and pronotal characters given in the key, other such characters can be used to distinguish these two species. The pronotum of *O. sayi* is densely and coarsely punctate and often has a dark discal marking. That of *O. arizonae* is finely punctate and smooth, and it never has a dark discal marking. In addition, the elytra of *O. arizonae* nearly always have a distinct bluish reflection; the elytra of *O. sayi* usually have no bluish reflection or may have a weak bluish reflection.

***Oulema brunnicollis*
(Lacordaire)**
(figs. 45, 58, 59, 85, 122)

Lema brunnicollis Lacordaire, 1845:391; LeConte, 1849:34 (distribution); Suffrian, 1863:227 (taxonomy); Clark, 1866:29 (world catalog); Crotch, 1873b:94 (N. Amer. checklist); Crotch, 1873a:25 (taxonomy); Gemminger and Harold, 1874:3251 (world catalog); Hubbard and Schwarz, 1878:660 (distribution); Schwarz, 1878:458 (distribution, host); Dury, 1879:11 (distribution); Henshaw, 1885:105 (N. Amer. checklist); Smith, 1890:241 (distribution); Smith, 1900:299 (distribution); Slosson, 1902:319 (distribution); Ulke, 1902:27 (distribution); Jacoby and Clavareau, 1904:15 (world catalog); Wickham, 1909:30 (distribution); Smith, 1910:338 (distribution, host); Blatchley, 1910:1111 (taxonomy); Blatchley, 1913:21 (taxonomy); Clavareau, 1913:57 (world catalog); Johnson, 1916:120 (distribution); Chagnon, 1917:239 (distribution); Dozier, 1918:370 (distribution); Leng, 1920:287 (N. Amer. checklist); Britton, 1920:273 (distribution); Dozier, 1920:367 (distribution); Dozier, 1922:117 (distribution); Carr, 1923:197 (distribution); Leng and Davis, 1924:65 (distribution, host); Blatchley, 1924:39 (distribution, hosts); Johnson, 1927:114 (distribution); Frost, 1929:215 (taxonomy); Hendrickson, 1930:105 (distribution, host); Schaeffer, 1933:306 (in key); Proctor, 1938:156 (distribution); Brimley, 1938:221 (distribution); Blackwelder, 1939:60 (N. Amer. checklist); Hughes, 1944:130 (distribution); Proctor, 1946:186 (distribution); Fattig, 1948:5 (distribution); Wilcox, 1974a:7 (N. Amer. checklist); Wilcox, 1974b:8 (Amer. checklist).
Oulema brunnicollis (Lacordaire), Monros, 1960:229 (world checklist).

Diagnosis

Head distinctly bituberculate; legs mostly very dark reddish to black; head weakly punctate, alutaceous, not shiny.

Description

General. Head, prothorax, and ventral surface more or less red to orange red; head and prothorax often partly dark, ventral surface partly to almost entirely dark; antennae and legs predominantly red, partly dark, may be predominantly to entirely dark; elytra black, sometimes with a bluish reflection. Dorsal surfaces usually shiny; pronotum sometimes weakly shiny; head, ventral surfaces, and legs usually with weak luster.

Color Variation. Often clypeus and labrum dark to black and frons darkened; sometimes head predominantly dark but with dull red evident; pronotum may be darkened either at anterior 1/2 or anteriorly on each side; when abdomen predominately dark, then apex reddish; when metasternum dark, sides usually reddish.

Head. An antenna a little more than 1/2 as long as body, outer antennal segments elongated, segments 7–10 each a little less than 2 times as long as wide, 11th segment about 2 times as long as wide. Vertex (figs. 58-59) with a median, longitudinal groove; surface on each side of groove moderately to distinctly produced and with fine punctation of moderate density; surface also more or less alutaceous. Clypeus with fine punctation, also often alutaceous.

Pronotum. Widest at base, but apex nearly as wide as base; constriction median, width at constriction about 93% of width at base; surface with fine punctation and with very large punctures in a group on each side of middle and in a longitudinal, median (usually double) series in anterior 2/3; disk with a median pit at basal 1/4; below pit, a shallow, transverse, arcuate depression.

Elytra. Weak indication of a basal depression; surface between striae with weak to distinct fine, generally transverse grooves and no fine punctures; 9th stria complete; elytra moderately elongated, an elytron about 3 times as long as wide.

Ventral Surface. Metasternum with fine punctation, moderate in density; surface often alutaceous. Abdomen with fine punctures generally arranged in a transverse series on each sternite, scattered on 5th sternite; surfaces alutaceous.

Length. Body 3.6–5.1 mm.

Aedeagus. In lateral view (fig. 122) widest immediately behind anterior declivity, anterior portion weakly sinuate both above and below; in lateral view interior processes very simple, consisting of 1 small elongated process and a larger, broader, arcuate process.

Type Material

The holotype of *O. brunnicollis* was not found in either the British Museum of Natural History (London) or in the Institut Royal Sciences Belgique (Brussels, Belgium), museums in which some of the Lacordaire types are deposited. Therefore, I do not know the location of the type. In the original description the locality of collection is given as “Des États-Unis.”

Material Examined

I examined 20 specimens of *O. brunnicollis*. They were collected in the following locations. **Alabama**—Tuscaloosa. **Florida**—Dunedin; Sarasota; Alachua Co.; Gainesville; Tarpon Springs; Miami; Collier Co.

Distribution

Oulema brunnicollis occurs only in Southeastern United States (fig. 85).

Hosts

The following are literature notes: On *Carduus* (Schwarz 1878:458); on flowers of *Carduus spinosissimus* Walt. (Blatchley 1924:39). Blatchley (1913:21) reported “*Lema brunnicollis* Lac., abundant on the flowers and foliage of the thistle *Carduus horridulus* Push. The first blossom of this thistle opened near Sarasota on February 6th, and the first *Lema* was taken on the 8th. They were found mating on February 16th, and again at Sanford on March 28th.”

Remarks

Blatchley (1913:22) reported the length of *O. brunnicollis* as 5.0–5.5 mm. I have seen no specimen over 5.1 mm in length. I have seen six specimens of *O. brunnicollis* from the Blatchley collection, and their lengths range from 4.3 to 5.1 mm.

I have not seen the type of *O. brunnicollis* (Lac.) and follow the accepted assignment of the name, that is, to the species that is similar to *O. palustris* and that occurs in Florida. I accept the interpretation of Blatchley (1913:21). He stated (p. 22) that both Fredrick Blanchard and Frederic Knab agreed with him that the southern species is undoubtedly the one described as *L. brunnicollis* by Lacordaire. Unfortunately, there is no indication in Lacordaire (1845:391) as to the precise locality of collection.

According to Frost (1929:215), the species known then as *L. palustris* was known before 1913 as *L. brunnicollis* Lac. Thus, some of the pre-1913 references cited above may not actually refer to *O. brunnicollis*.

For notes on the characters that distinguish *O. brunnicollis* from *O. palustris*, its nearest relative, see under the latter.

Few specimens of *O. brunnicollis* are without at least some darkening of the head and pronotum that is referred to in the description above. This darkening of reddish areas is more frequent and extensive on the ventral surface and the legs.

Oulema coalescens
White, New Species
(figs. 27, 76)

Diagnosis

Pronotum with a weak, submedian constriction; elytra light with 3 black stripes.

Description

General. Body predominantly orange, with following exceptions: Antennae (except basal segment) brown, tibial apices and tarsi more or less brown, head above each eye black, each elytron with sutural and lateral 1/3 area black. Body surfaces shiny throughout.

Color Variation. Not known (just 1 specimen).

Head. An antenna about 2/3 length of body; outer segments elongated, segment 7 about 3 times as long as wide, segments 8–10 about 2 times as long as wide, segment 11 a little less than 2 times as long as wide. Vertex with a fine, distinct, median groove; surface minutely punctate, each side of groove weakly convex. Clypeus with a large puncture on each side, and with a few small punctures.

Pronotum. Basal width slightly greater than anterior width, width a little greater than length; constriction submedian, width at constriction 83% of width at base; surface smooth, with fine punctures located medially in anterior 2/3 and also anteriorly on each side; at basal 1/3, a weak transverse depression with a fine, median pit.

Elytra. Feeble evidence of a basal, transverse depression; 3d stria with 10 punctures in basal 1/2 of elytron; 4th stria not extending past middle of elytron, 3d and 5th striae joining beyond middle of elytron; 6th stria much abbreviated, present on basal 1/3 only; 9th stria broadly incomplete, with a gap of 11 punctures; surface between punctures of striae smooth, with no small punctures or fine grooves. Elytra elongated, each elytron 3.5 times as long as wide; black on elytron forming a stripe on first 2 intervals and a lateral stripe extending from humerus to apex, latter stripe narrowed medially and expanded apically to cover outer 4 intervals.

Ventral Surface. Metasternum with fine, moderately dense punctation nearly throughout but nearly absent posteriorly at middle; abdomen with fine, not dense punctation.

Length. Body 4.7 mm.

Type Material

The female holotype of *O. coalescens* (CNCI) bears a label stating "6 mi. E. Keremeos B.C., 22.V.1959, R.E. Leech."

Distribution

Oulema coalescens is known only from the extreme southern border of British Columbia, Canada (fig. 76).

Remarks

Oulema coalescens is so unique that it is difficult to name a species of the North American fauna to which it is closely related. It is, however, markedly similar in virtually all respects to the Central American species *Lema approximata* Jacoby and the Mexican *L. cinctipennis* Jacoby. I compared *O. coalescens* and two USNM series of *L. approximata* and *L. cinctipennis*. I found *O. coalescens* to differ from the other two species in only head color. There were no definitive differences between the USNM series of *L. approximata* and *L. cinctipennis*, thus raising doubt in my mind that they are distinct species.

***Oulema collaris* (Say)** (figs. 37, 80, 109)

Lema collaris Say, 1824:430.

Crioceris collaris (Say), Harris, 1833:580 (distribution).

Lema collaris (Say) Lacordaire, 1845:545 (taxonomy); Suffrian, 1863:227 (taxonomy); Clark, 1866:35 (world checklist); Crotch, 1873b:94 (N. Amer. checklist); Crotch, 1873a:25 (in key, brief description); Gemminger and Harold, 1874:3252 (world catalog); Popenoe, 1877:34 (distribution, host); Coquillett, 1883:21 (biology); Henshaw 1885:105 (N. Amer. checklist); Townsend, 1889:234 (distribution); Smith, 1890:241 (distribution); Castle and Laurant, 1896:304 (distribution); Castle and Laurant, 1897:9 (distribution); Smith, 1900:299 (distribution, host); Knaus, 1901b:113 (distribution, host); Dury, 1902a:58 (distribution); Dury, 1902b:164 (distribution); Jacoby and Clavareau 1904:15 (world catalog); Longley, 1905:125 (distribution); Evans, 1906:99 (distribution); Wickham, 1909:30 (distribution); Smith, 1910:338 (distribution, host); Blatchley, 1910:1111 (taxonomy); Clavareau, 1913:15 (world catalog); Blatchley, 1924:39 (host); Knaus, 1926:265 (distribution); Brisley, 1928:118 (in key); Hendrickson, 1930:105 (biology); Schaeffer, 1933:306 (in key); Brimley, 1938:221 (distribution); Blackwelder, 1939:61 (N. Amer. checklist); Hughes, 1944:130 (distribution); Fattig,

1948:5 (distribution); Wilcox, 1954:377 (taxonomy, host); Balsbaugh and Hays, 1972:19 (taxonomy, host); Wilcox, 1974a:7 (N. Amer. checklist); Wilcox, 1974b:8 (Amer. checklist); Wilcox, 1979:24 (hosts).
Oulema collaris (Say), Monros, 1960:229 (world checklist).

Diagnosis

Pronotum red, orange, or yellow; elytra unicolorous; head not bituberculate; length 3.9–5.3 mm; legs and ventral surface black; pronotum wider than long to as wide as long, not clearly bulging anteriorly; elytra 1.66–1.80 times as long as wide.

Description

General. Prothorax red orange to orange or yellow orange, head at extreme base orange, remainder of body and appendages black; elytra nearly always with a weak bluish reflection. Body surfaces shiny to moderately shiny throughout.

Color Variation. Infrequently elytral reflection weakly purplish; in some specimens prothoracic disk with a pair of vague, elongated, dark markings.

Head. An antenna about 1/2 length of body; outer segments broad, segments 7–10 each but slightly longer than wide, 11th segment 1.3 times as long as wide. Vertex with a deep, median, elongated fovea and with coarse punctation and sculpturing; surface each side of fovea weakly convex. Clypeus with coarse and moderate-sized punctation.

Pronotum. Width greatest near apex, a little greater than length; constriction submedian, width at constriction about 85% of width near apex; surface punctation fine and sparse but irregular in size nearly throughout, largest punctures located medially and anteriorly each side; at basal 1/4 a moderate to weak transverse depression with a distinct, median pit.

Elytra. Weak to (usually) no transverse depression at basal 1/4; 3d stria with 12–15 punctures in basal 1/2 of elytron; 9th striae complete, surface between striae smooth, with only feeble development of fine punctation and transverse grooves. Elytra elongated, each elytron about 3.3 times as long as wide.

Ventral Surface. Metasternum with moderate-sized punctation sparse at middle, nearly absent at sides. Abdominal segments with sparse, moderate-sized punctures; punctures more or less transversely aligned into a single row on sternites 1–4; punctures scattered on sternite 5; punctures of abdomen bearing setae moderate in length.

Length. Body 3.9–5.3 mm.

Aedeagus. In lateral view (fig. 109) widest medially, widest point behind anterior declivity, apical tip weakly directed downward, upper apical margin weakly sinuate. In dorsal view, weakly widest basally, somewhat narrowed anteriorly; 3 lobes overlie orifice, median lobe weakly arcuate, portion behind lobe weakly convex. Internal processes simple, symmetrical in dorsal view, form not clearly that of a human figure.

Type Material

The loss of nearly the entire Thomas Say collection necessitates the designation of a neotype for *Oulema collaris* (Say). Collection data with the original description of this species (Say 1824:429) include, "Inhabits Missouri." I hereby designate a neotype (USNM) from Missouri. Its label states, "Columbia, Mo., C.R. Crosby Coll.; *collaris* Say; Charles Schaeffer Collection; HS Barber Bequest 1950."

Material Examined

The specimens of *O. collaris* examined totaled 296. They were collected in the following locations. **Colorado**—Manitou. **Florida**—no locality given. **Georgia**—Stone Mt. **Illinois**—Lyon; Willow Springs; Beverly Hill; Chicago; Edgebrook; Riverside; Mason St. For., Mason Co. **Indiana**—Hessville; Osborn; Posey Co.; Marion Co.; Elkhart; Clarke Junc.; Tippecanoe Co.; San Pierre; Indianapolis; Jasper Pulaski Forest; Starke Co. **Iowa**—Iowa City; Independence. **Kansas**—Topeka; Onaga; Atchison. **Michigan**—Niles; Berrien Co. **Missouri**—Columbia; St. Louis; Randolph Co.; St. Francois Co.; St. Clair Co. **Nebraska**—no locality given. **North Carolina**—Whiteside Mt., Highlands. **Ohio**—Cincinnati; Cedar Point; Erie Co.; W. Lafayette. **Oklahoma**—Wichita Nt. For. **Wisconsin**—Waupaca.

Distribution

This species occurs from Florida to Ohio and west to Colorado (fig. 80).

Hosts

Label data follow: Spiderwort; on oats; on *Tradescantia virginiana*; on *Tradescantia ohiensis*; on *Tradescantia subaspera*. Literature notes follow: Rare on thistle (Smith 1900:299); food plant is spiderwort, *Tradescantia virginiana* (Blatchley 1924:39); feeds on thistle, *Cirsium lanceolatum* (Coquillett 1883:21); stem of *Tradescantia reflexa* (Hendrickson 1930:105). Wilcox (1979:245) recorded *Commelina* as a host.

Remarks

The greatest color variation in *O. collaris* involves the pronotum, the variation ranging from pale orange to red. The shape of the pronotum can vary, some specimens showing a tendency toward lateral expansion of the anterior portion of the pronotum. Such expansion is similar to, but not as great as, the pronotal expansion of *O. laticollis* White. The species *O. collaris* and *O. laticollis* are also similar in antennal form: the outer segments are enlarged in both species, in contrast to the often narrowed outer segments in other species of *Oulema*.

The nearest relative of *O. collaris* is *O. longipennis*; see under the latter for a discussion of the differences.

***Oulema concolor*
(LeConte), New
Combination**
(figs. 29, 72, 110)

Lema concolor LeConte, 1884:24; Henshaw, 1885:105 (N. Amer. checklist); Cockerell, 1902:379 (distribution); Jacoby and Clavareau, 1904:15 (world catalog); Cockerell, 1907:194 (distribution); Snow, 1907b:56 (distribution); Snow, 1907c:180 (distribution); Clavareau, 1913:59 (world catalog); Leng, 1920:287 (N. Amer. checklist); Monros, 1960:213 (world checklist); Wilcox, 1974a:6 (N. Amer. checklist); Wilcox, 1974b:8 (Amer. checklist).

Diagnosis

Entire body black; all abdominal segments densely punctate medially.

Description

General. Body nearly uniformly black throughout; pronotum with weak bluish reflection; elytra with distinct bluish reflection. Body surfaces shiny.

Color Variation. Tarsi and mandibles varying to dark brown; tibiae approach dark brown apically; pronotum sometimes weakly greenish.

Head. An antenna clearly over 1/2 as long as body; outer antennal segments elongated, segments 7–10 each about 1 1/2 times as long as wide, segment 11 nearly 2 times as long as wide. Vertex with a median fovea or elongated groove and with moderate-sized to large punctures; surface not produced each side of middle. Clypeus with large punctures in a transverse or irregular series and with moderate-sized punctures.

Pronotum. Base and apex subequal in width, width clearly greater than length; constriction submedian, width at constriction 85%–88% of width at base. Surface with irregular large and moderate-sized punctures, moderate in density, scattered; surface also with irregular flattened areas. Median, elongated, longitudinal fovea near base. At basal 1/3, a deep, arcuate, transverse depression, base of depression irregularly sculptured.

Elytra. Feeble indication of a basal transverse depression; 3d stria with 13–15 punctures in basal 1/2 of elytron; 9th stria complete; surface between striae smooth, lacking punctures, with feeble to moderate development of grooves. Elytra moderately elongated, each elytron about 3 times as long as wide.

Ventral Surface. Metasternum with moderate-sized punctation, moderate in density, least dense medially at rear and posteriorly each side. Abdomen with punctation of 1st sternite moderate in size and density, least dense on each side of segment; punctation of following sternites finer and generally denser than on 1st sternite.

Length. Body 4.0–4.5 mm.

Aedeagus. In lateral view (fig. 110) widest medially, subcylindrical; apical tip directed forward, sharply pointed; upper apical margin nearly straight. In dorsal view sides widest medially, 3 lobes overlie orifice, median lobe truncate, lateral lobes strongly arcuate, portion behind orifice weakly convex. Internal processes in lateral view semispiraled, in dorsal view symmetrical and not shaped like a human figure.

Type Material

The label for the type of *O. concolor* bears "MCZ no. 4256" and the data "Nr. Hot Springs, Las Vegas, N.M., 7000 ft. July 82, F.H. Snow."

Material Examined

A total of 16 specimens of *O. concolor* were examined. They were collected in the following locations. **Arizona**—Huachuca Mts., 9,000 feet; Santa Rita Mts., 6,200 ft., Santa Cruz Co.; Chiricahua Mts., 8,000–9,000 ft., Cochise Co. **New Mexico**—Porvenir; Las Vegas.

Distribution

Oulema concolor is known only from southeastern Arizona and northeastern New Mexico (fig. 72).

Hosts

Literature notes follow: On brake fern (Cockerell 1902:379); feeds on ferns at high altitudes (Pallister 1953:9).

Remarks

Oulema concolor is most similar to *O. margineimpressa*; for a discussion of the characters that distinguish these two species see under the latter.

Nearly all specimens of *O. concolor* show bluish reflections on the dorsal surface; these reflections may be greenish.

***Oulema cornuta*
(Fabricius), New
Combination**
(figs. 40, 60, 61, 77, 111)

Lema cornuta Fabricius, 1801:475; Illiger, 1804:159 (taxonomy); Dejean, 1821:115 (world checklist); Dejean, 1835:360 (world checklist); Dejean, 1837b:387 (world checklist); Lacordaire, 1845:382 (taxonomy); LeConte, 1849:34 (distribution); Clark, 1866:29 (world catalog); Crotch, 1873b:94 (N. Amer. checklist); Crotch, 1873a:25 (in key); Gemminger and Harold, 1874:3252 (world catalog); Schwarz, 1878:458 (distribution); Henshaw, 1885:105 (N. Amer. checklist); Jacoby, 1888:16 (taxonomy); Castle and Laurant, 1896:304 (distribution); Knaus, 1901a:112 (distribution); Jacoby and Clavareau, 1904:15 (world catalog); Clavareau, 1913:59 (world catalog); Blatchley, 1914:92 (distribution); Leng, 1920:287 (N. Amer. checklist); Blatchley, 1924:39 (distribution); Brisley, 1928:117 (in key); Douglass, 1929:4 (distribution); Schaeffer, 1933:305 (in key); Brimley, 1938:221 (distribution); Blackwelder, 1939:60 (N. Amer. checklist); Löding, 1945:126 (distribution, host); Blackwelder, 1946:629 (Amer. checklist); Fattig, 1948:5 (distribution); Monros, 1960:213 (world checklist); Balsbaugh and Hays, 1972:19 (taxonomy); Wilcox, 1974a:6 (N. Amer. checklist); Wilcox, 1974b:8 (Amer. checklist); Wilcox 1979:10 (hosts).

Diagnosis

Pronotum red, orange, or yellow; head moderately bituberculate (figs. 60–61); femora orange to red, with apices and remainder of legs black.

Description

General. Red to orange to nearly yellow as follows: Prothorax, ventral surface, most of head, base of legs to near femoral apices. Following black: Mouth-parts, antennae, femoral apices and remainder of legs, elytra (which usually

show weak to moderately bluish, greenish, or purplish reflection). Last antennal segment sometimes brown to red brown. Dorsal surfaces shiny; ventral surfaces moderately shiny.

Additional Color Variation. Trochanters and base of femora may be black; femora may be red throughout; base of tibiae sometimes orange.

Head. An antenna nearly $2/3$ as long as body; outer segments elongated, each of segments 7–11 nearly 2 times as long as wide. Vertex (figs. 60–61) with a median, elongated depression or groove; surface each side of groove distinctly convex, with fine, moderately dense punctation and sculpturing. Clypeal surface with coarse and fine punctation, moderate in density.

Pronotum. Widest at base, width a little greater than length; constriction submedian, width at constriction about 85% of width at base; moderate-sized punctures from base to past middle and on each side of apex, also with very fine punctures nearly throughout; near basal $1/3$, no to weak median pit; at basal $1/4$, a weak transverse depression.

Elytra. Basal depression absent; 3d stria with 11–13 punctures in basal $1/2$ of elytron; 9th stria usually complete, infrequently with a gap of up to 4 punctures; surface between striae smooth, with no to weak development of fine punctation and transverse grooves; sometimes punctures of striae aligning transversely in basal $1/4$. Elytra much elongated, each elytron about 3.5 times as long as wide

Ventral Surface. Metasternum with fine, moderately dense punctation nearly throughout. Abdomen medially with fine, moderately dense punctation, at sides of sternites punctation denser; punctures bearing very short setae.

Length. Body 4.5–6.2 mm.

Aedeagus. In lateral view (fig. 111) widest medially, apical tip weakly inclined downward and sharply pointed, upper apical margin nearly straight; in dorsal view feebly widest apically, apex blunt, sides behind apex nearly straight, 3 lobes overlie small orifice, median lobe truncate, portion behind orifice concave; internal processes in lateral view spiraled, in dorsal view asymmetrical.

Type Material

The Bosc collection (the source of the type) is in the Muséum National d'Histoire Naturelle, in Paris; however, neither I nor Blake (1952) found the type of *O. cornuta* there, and I assume it is lost. According to Blake, Louis A.G. Bosc lived at Charleston, South Carolina, so I select as neotype (USNM) a specimen with the information "On rice leaves, Charleston S.C. #SS58.6.25'43."

Material Examined

I examined 208 specimens of *O. cornuta* collected from the following locations. **Alabama**—Tuscalusa; Mobile. **Florida**—St. Petersburg; Crescent City; Hobe Sound; Capron; Biscayne; Largo; Stuart; Jacksonville; Miami Beach; Fort Matamas; Alachua Co.; Hialeah; Lake Mary; Enterprise; Key Largo; Highlands Co.; Punta Gorda; Lake Alfred; Orlando; 10 mi N. Lake Placid; Avon Park;

Tampa; Siesta Key, Sarasota Co.; Indiantown; Hollywood; Brevard Co.; Clay Co.; Monroe Co. **Georgia**—Zebulon. **Louisiana**—Opelousas. **Maryland**—Plummers Isle; Great Falls. **Missouri**—Columbia. **North Carolina**—Kill Devil Hills, Dare Co. **South Carolina**—Charleston.

Distribution

Oulema cornuta occurs in Southeast United States from Maryland to Florida to Louisiana and Missouri (fig. 77).

Hosts

Label data follow: On rice leaves; *Commelina communis*. Literature notes are as follows: Swept from hoary lupine (Blatchley 1914:92); swept from natal grass (Blatchley 1924:39); on *Tradescantia* (Löding 1945:126).

Remarks

The extent of elytral melanism varies weakly in *O. cornuta*. The elytra are generally quite dark and opaque, but those of roughly one-third of the specimens show some red or dark brown.

Metallic reflection of the elytra is present in a large majority of the specimens and is usually bluish but varies to greenish, or even weakly purplish.

Enlargement of the hind femora is a variable character, with a few specimens having clearly wider and more elongated hind femora than most specimens. Hind femora are typically about 3 times as long as wide, but are about 2 1/2 times as long as wide in some specimens.

Oulema cornuta and *O. simulans* are very similar in most color and morphological features. Were it not for the leg color characters (*O. cornuta*, femora red with apices and remainder of legs black; *O. simulans*, femora red throughout with tibiae red basally, black apically), they would be difficult to separate. The interocular tubercles are generally more developed in *O. cornuta* than in *O. simulans*, but not sufficiently more developed to allow separation. Reduction of elytral melanism (with brown to red showing) occurs in both species but more frequently in specimens of *O. simulans* than in those of *O. cornuta*.

The development of the interocular tubercles in *O. cornuta* is quite variable; for that reason *O. cornuta* keys both ways from couplet 5 of the key to species. On the one extreme the tubercles are small and similar to those typical for *O. simulans* (figs. 56–57), and on the other extreme the tubercles are as well developed as those of *O. texana* (figs. 64–65) and *O. palustris* (figs. 62–63). Figures 60 and 61 show the tubercles of *O. cornuta* at near their maximum development.

***Oulema elongata* White,
New Species**
(figs. 33, 82, 112)

Diagnosis

Pronotum red or orange; elytra bicolored; head not tuberculate; length 4.6–6.5 mm; femora orange to red orange; ventral surface mostly black; 9th elytral stria not interrupted; tibiae black.

Description

General. Most of head, prothorax, mesothorax, procoxae, mesocoxae, and femora orange to red orange; antennae, labrum, elytra, tibiae, tarsi, metasternum, hind coxae, and abdomen black; elytra with a distinct bluish reflection. Body surfaces shiny throughout.

Color Variation. Sometimes clypeus and/or margins around eyes black; femora infrequently dark apically; tibiae often more or less reddish basally to nearly throughout; metasternum rarely reddish basally; mesothorax partly to nearly entirely dark; hind coxae sometimes reddish.

Head. An antenna about 1/2 as long as body; outer segments broad, segments 7–10 each a little longer than wide, segment 11 clearly longer than wide. Vertex with a deep, distinct, median groove; surface convex on each side of groove and with moderate-sized to large punctures or grooves. Clypeus with moderate-sized to large punctures, moderate in density.

Pronotum. Clearly widest apically, width a little greater than length; constriction submedian, width at constriction about 87% of width at apex. Surface punctation fine and sparse but also with moderate-sized punctures, these aligned more or less medially and also located anteriorly on each side. Near basal 1/3, a distinct, median pit; near base, a broad, weak, transverse depression.

Elytra. No evidence of a transverse depression near base; 3d stria with 13–17 punctures in basal 1/2 of elytron; 9th stria complete; surface between striae smooth, with scattered fine punctures and no to feeble development of grooves. Elytra much elongated, each elytron about 3.7 times as long as wide.

Ventral Surface. Metasternum with sparse moderate-sized punctation, nearly absent posteriorly; abdomen with sparse, moderate-sized punctation mostly arranged in transverse series.

Length. Body 4.6–6.5 mm.

Aedeagus. In lateral view (fig. 112) quite broad, widest medially just behind apical declivity, apical tip inclined downward and sharply pointed, both upper and lower apical margins weakly sinuate; in dorsal view sides basally subparallel and narrowed anteriorly, 3 lobes overlie small orifice, median lobe arcuate, portion behind orifice weakly concave; internal processes complex, in dorsal view symmetrical, clearly in form of a human figure.

Type Material

I examined the holotype and 73 paratypes of *O. elongata*. Complete label data for the specimens are quoted below.

Type material

Holotype (USNM)

Label data

Texas, Hardin Co.; Larsen Sanctuary, 22 May, 1981, Faden & Primack; on *Commelina erecta* v. *deamiana* Det. R. Faden, Chewing petals. Faden & Primack 71.

<i>Type material</i>	<i>Label data</i>
49 paratypes (39 in EGRC, 10 in USNM)	LA: Natchitoches Par., Kisatchie Nat. For. nr. Red Bluff Campgrd., V-15-82: E.G. Riley; on <i>Tradescantia</i> sp., Commelinaceae.
19 paratypes	[Same as for the above 49 paratypes but differing in dates, as shown below.]
4 (EGRC)	VI-7-83.
5 (3 EGRC, 2 USNM)	V-22-82.
7 (5 EGRC, 2 USNM)	V-17-84.
2 (EGRC)	VI-21-84.
1 (EGRC)	Texas: Cass Co.; Dangerfield St. Pk., 28 May '77: Col. Riley & LeDoux.
1 paratype (EGRC)	LA: Natchitoches Par., Long Leaf Vista V-15-82: E.G. Riley, Kisatchie Nat. For.
3 paratypes (TAMU)	TEXAS: Anderson Co., Salmon, April; 28-May 16, Malaise Trap., H.R. Burke.
1 paratype (USNM)	TEXAS: Salmon, Anderson Co., V.1-15-1974; H.R. Burke; taken from malaise trap.

Distribution

Oulema elongata occurs in eastern Texas and adjacent Louisiana (fig. 82).

Hosts

Label data state, on *Commelina erecta* v. *deamiana*; on *Tradescantia* sp.

Remarks

The specific name *elongata* refers to the elongated body. Although it keys closest to *O. melanopus*, *O. elongata* is closest to *O. simulans* in morphology. The morphological similarities involve size, form of pronotum, and form of head. But *O. elongata* and *O. simulans* are readily separated by color of metasternum and abdomen (black in *O. elongata*, red in *O. simulans*). These species are also dissimilar in antennal form: antennal segments 8–10 are about as wide as long in *O. elongata* but are about 2 times as long as wide in *O. simulans*.

Color variation in this species is negligible.

***Oulema laticollis* White,
New Species**
(figs. 41, 79, 113)

Diagnosis

Pronotum bulging and distinctly widest anteriorly, orange throughout; ventral surface, legs, and antennae black.

Description

General. Prothorax almost entirely orange, just margins on ventral surface black; gula orange; remainder of body and appendages black; elytra lacking a blue reflection; surfaces shiny throughout.

Color Variation. Mouthparts may be orange in part.

Head. An antenna clearly less than 1/2 to 1/2 as long as body; outer segments broad, segments 7–10 each a little longer than wide, segment 11 clearly longer than wide. Vertex with a deep, longitudinal groove; surface with coarse punctures and sculpturing; surface on each side of groove moderately convex. Clypeal area with coarse and fine punctation, not dense.

Pronotum. Clearly widest near apex, width 1.15 times greater than length; constriction submedian, width at constriction about 80% of width near apex. At basal 1/4, a median fovea and a weak transverse depression. On surface, moderate-sized punctures present in a median series from anterior to past middle, and also present in anterior of each side; also on surface, smaller irregular-sized punctures.

Elytra. Basal depression absent; surface between striae smooth; each interval with a series of moderate-sized punctures and with feeble development of transverse grooves; 3d stria with 13–17 punctures in basal 1/2 of elytron; 9th stria complete. Elytra much elongated, elytron about 3.7 times as long as wide.

Ventral Surface. Metasternum with fine and sparse punctation medially, impunctate at sides, each puncture bearing a seta. Sternites 1–4 each with a transverse series of punctures before apex; sternite 5 with a few moderate-sized punctures, these bearing short setae; sternites at extreme sides with patches of fine punctures bearing very short setae.

Length. Body 5.3–6.1 mm.

Aedeagus. In lateral view (fig. 113) quite broad, widest medially, widest point behind anterior declivity, apical tip directed downward and sharply pointed, upper apical margin weakly convex; in dorsal view sides weakly widest basally, 3 lobes overlie small orifice, median lobe arcuate, portion behind orifice concave; internal processes complex, in dorsal view clearly in form of a human figure.

Type Material

Ten specimens (USNM) of *O. laticollis*, including the male holotype, bear labels stating, "Florida, Highlands Co., Archbold Station, 4-7, V, 1969; R.E. and Jan White Collectors." Two paratypes (FSCA) bear labels stating, "Avon Park, FLA, Highlands Co.; H.V. Weems, Jr., Coll. 26-V-69." Six specimens (NMDC) bear labels stating, "FL: Highlands Co., Archbold Biol. Sta., N.M. Downie." (Two of these six were collected on "IX-9-1983"; two, on "14-April 1983"; and one, on "15-April, 1983.") The number of specimens I examined is 18.

Distribution

This species is known only from central Florida (fig. 79).

Hosts

The 10 specimens collected by R.E. and Jan White were from *Tradescantia* sp., probably *hirsuticaulis*. They were taken in early morning from flowers of

the plant at a roadside; there was evidence of feeding on petals. Larvae were found boring in stems of the plant and one pupa was found in the bored stem of a plant.

Remarks

The species *O. laticollis*, *O. collaris*, and *O. longipennis* are clearly quite similar in morphology and color. The most distinctive single character of *O. laticollis* is its anteriorly widened prothorax. This widened prothorax plus the body length (5.3–6.1 mm) distinguishes *O. laticollis* from *O. collaris* (prothorax weakly widened; length 3.9–5.3 mm). *Oulema longipennis* has a weakly widened prothorax and occurs in Central United States. *Oulema laticollis* occurs only in central Florida; *O. collaris* occurs from Central United States into Florida.

Oulema longipennis
(Linell)
(figs. 31, 72, 114)

Lema longipennis Linell, 1897:474; Wickham, 1902:284 (distribution); Jacoby and Clavareau, 1904:15 (world catalog); Snow, 1907:20 (distribution); Wickham, 1909:30 (distribution); Clavareau, 1913:69 (world catalog); Leng, 1920:287 (N. Amer. checklist); Brisley, 1928:117 (in key); Schaeffer, 1933:300 (in key, distribution notes); Blackwelder, 1939:61 (N. Amer. checklist); Wilcox, 1974a:7 (N. Amer. checklist); Wilcox, 1974b:8 (Amer. checklist).

Oulema longipennis (Linell), Monros, 1960:229 (world checklist).

Diagnosis

Length 4.5–6.3 mm; elytra unicolorous, 1.8–2.0 times as long as width at humeri; ventral surface and legs black; head not tuberculate; Colorado and Texas to Illinois.

Description

General. Prothorax and extreme base of head orange to orange red; remainder of body black, elytra often with weak bluish reflection. Body surfaces shiny.

Color Variation. Pronotal disk rarely bearing a black spot above middle, more often bearing vague, elongated dark markings; femoral apices sometimes reddish.

Head. An antenna about 0.4 times as long as body; outer segments broad, segments 7–10 each a little longer than wide, segment 11 clearly longer than wide. Vertex with a deep, longitudinal groove; surface with coarse punctures and sculpturing; surface each side of groove weakly convex. Clypeus with coarse and fine punctation, not dense.

Pronotum. Pronotum widest anteriorly, width a little greater than length; constriction submedian, width at constriction about 88% of anterior width; at basal 1/4, a weak, transverse depression with a median fovea; moderate-sized punctures present along midline from apex to below middle and on each side of apex; small and sparse punctures nearly throughout.

Elytra. Basal depression absent; surface between striae smooth, with weak to feeble development of fine punctation and transverse grooves; 3d stria with 13–16 punctures in basal 1/2 of elytron; 9th stria complete. Elytra elongated, each elytron about 3.5 times as long as wide.

Ventral Surface. Metasternum usually with some fine, sparse punctation medially, lacking punctation at sides; each puncture bearing a seta. Sternites 1–4 each with a fine, transverse series of punctures before apex, otherwise without punctures; sternite 5 with punctation and fine sculpturing, punctures bearing pubescence of moderate length; abdomen with no other pubescence.

Length. Body 4.5–6.3 mm.

Aedeagus. In lateral view (fig. 114) slender, widest medially, apical tip directed forward and sharply pointed, upper apical margin nearly straight; in dorsal view somewhat widest anteriorly, apex blunt with 3 lobes overlying small orifice, median lobe extended and pointed, broad basally, portion behind orifice nearly flat; internal processes complex, in dorsal view clearly in form of a human figure.

Type Material

The holotype (USNM) of *O. longipennis* bears a label with the data “Canon City Colorado Wickham; Type No. 1290; *Lema longipennis* Type Linell.”

Material Examined

The number of specimens examined is 60. The specimens were collected in the following locations. **Colorado**—Boulder; Canon City; Coronado; Matou. **Illinois**—Riverside; Champaign; Madison Co; Chicago; 5 mi S. Bath. **Iowa**—Iowa City. **Kansas**—Medora; Seneca. **Michigan**—George Reserve. **Missouri**—Moberly. **Nebraska**—Cherry Co. **Texas**—Kerrville; Burnett Co.; Gillespie Co.; Anderson Co.

Distribution

Oulema longipennis occurs from Texas north to Nebraska and east to Illinois (fig. 72).

Host

The following is from a label: On spiderwort.

Remarks

There are three specimens (OSUC) of *O. longipennis* representing two of the Texas localities and these specimens are smaller than other members of this species (length 4.5–4.7 mm, versus 4.8–6.3 mm) but are typical in other regards.

The species *O. collaris* and *O. longipennis* are as similar and difficult to distinguish as any two species of *Oulema*. The most useful characters for distinguishing these two are given in the key; however, there is at least a degree of overlap in all of the useful features: elongation of the elytra, body lengths, and distributions.

Oulema maculicollis
(Lacordaire), New
Combination
(figs. 39, 68, 81, 115)

Lema maculicollis Lacordaire, 1845:392; LeConte, 1849:34 (distribution); Clark, 1866:29 (world catalog); Crotch, 1873b:94 (N. Amer. checklist); Crotch, 1873a:25 (taxonomy); Gemminger and Harold, 1874:3256 (world catalog); Schwarz, 1878:458 (distribution); Henshaw, 1885:105 (N. Amer. checklist); Jacoby and Clavareau, 1904:15 (world catalog); Clavareau, 1913:69 (world catalog); Leng, 1920:287 (N. Amer. checklist); Blatchley, 1924:39 (distribution); Schaeffer, 1933:306 (in key); Blackwelder, 1939:61 (N. Amer. checklist); Löding, 1945:126 (distribution); Fattig, 1948:5 (distribution); Monros, 1960:213 (world checklist); Balsbaugh and Hays, 1972:19 (taxonomy); Wilcox, 1974a:6 (N. Amer. checklist); Wilcox, 1974b:8 (Amer. checklist).

Diagnosis

Pronotum a little longer than wide; length 3.2–4.2 mm; ventral surface and legs black; head not tuberculate; elytra unicolorous.

Description

General. Base of head and usually entire prothorax orange to orange red; roughly anterior 1/2 of head, antennae, legs, elytra, and ventral surface usually black; elytra shiny with no or feeble bluish reflection; remainder of body surfaces moderately shiny.

Color Variation. Dark pigment on head, antennae, and legs may be dark brown and not black; dark pigment on head generally surrounds eyes and may infringe on frons; when legs are brown and not black, bases of femora and tibiae may be red brown; infrequently pronotal disk with vague pair of brown to black markings on each side; infrequently metasternum medially and abdomen apically red brown.

Head. An antenna 1/2 to (usually) clearly more than 1/2 as long as body; outer antennal segments elongated, segments 7–10 each about 1.5 times as long as wide, segment 11 about 2 times as long as wide. Vertex with a medial, distinct pit or broad, elongated groove; each side of groove not at all produced. Clypeus with fine punctation of moderate density, with a large puncture on each side.

Pronotum. Just below apex a little wider than at base, length a little greater than width (fig. 68); constriction submedian, width at constriction about 90% of width just below apex. Punctation mostly fine and moderate in density to dense; large punctures present anteriorly on each side and more or less serially along midline. At about basal 1/6, a median pit; near base a feeble indication of a transverse depression.

Elytra. No evidence of a basal transverse depression; surface between striae smooth, with fine punctures only on 8th interval, and (at most) only feeble development of grooves; 3d stria with 9–13 punctures in basal 1/2 of elytron; 9th stria complete. Elytra elongated, each elytron about 3.3 times as long as wide.

Ventral Surface. Metasternum with moderate-sized punctures, generally moderate in density; punctures nearly absent medially except at anterior margin, densest anteriorly on each side. Abdominal sternite 1 with moderate-

sized punctures, moderate in density, nearly absent medially, sternites 2–5 with finer, denser punctation; sternites 2–4 with punctation nearly absent posteriorly near middle; sternite 5 with punctation nearly absent medially.

Length. Body 3.2–4.2 mm.

Aedeagus. In morphology of the aedeagus, *O. maculicollis* is the most aberrant of all of the North American species of *Oulema*. In lateral view (fig. 115) widest medially, widest point behind apical declivity, apical tip directed forward, upper apical margin clearly sinuate; in dorsal view sides subparallel, large orifice not overlaid by a lobe, portion behind orifice concave; internal processes simple and in dorsal view asymmetrical.

Type Data

The holotype of *O. maculicollis* was not found in either the British Museum of Natural History, in London, or in the Institut Royal Sciences Belgique, in Brussels, museums in which some of the Lacordaire types have been deposited; the location of the type is not known. While I was at the Museum d'Histoire Naturelle, in Paris, Nicole Berti suggested to me that Lacordaire types were in Helsingfors, Sweden. Inquiry directed to the Universitets Zoologiska Museum in Helsingfors brought the response from Hans Silfverberg that Lacordaire types were not there. In the original description the area of collection is given as “Des Etats Unis.”

Material Examined

I examined 48 specimens collected in the following locations. **Arkansas**—Montgomery Co. **Florida**—Haw Creek; Miami; Lashby; Alachua Co. **Louisiana**—Carlington, Natchitoches Parish, Kisachtie Nat. For; Webster Par., Shongaloo; Beauregard Par., 5 mi. S. DeRidder. **Mississippi**—Pascagoula. **Missouri**—Vernon Co.; Barton Co.; Pettis Co.; Junction highways 52 & 65; Weldon Spr.; St. Charles Co.; Pike Co.; Callaway Co.; Henry Co.; Ashland; New Hartford. **Oklahoma**—Mayes Co., 7 mi. S. Chauteau. **South Carolina**—Hilton Head Isl.

Distribution

The greatest number of specimens have been found from Missouri to Louisiana; the species also extends east to Florida and South Carolina (fig. 81).

Host

The following is from a label: On sweet potato leaves.

Remarks

The name *Lema maculicollis* was first published by Dejean in 1835 (p. 360) and again by in Dejean in 1837b (p. 387), but in each instance it was a nomen nudum.

***Oulema
margineimpressa*
(Schaeffer),
New Combination**
(figs. 28, 67, 70, 116)

Lema margineimpressa Schaeffer, 1933:299; Blackwelder, 1939:60 (N. Amer. checklist); Monros, 1960:213 (world checklist); Wilcox, 1974a:6 (N. Amer. checklist); Wilcox, 1974b:8 (Amer. checklist).

Diagnosis

Body nearly entirely black; abdominal segments not densely punctate medially.

Description

General. Nearly entire body black; some parts may be dark red brown; most surfaces with a bluish reflection; elytra with a purple bluish reflection. Body surfaces shiny throughout.

Color Variation. Tibiae, abdomen, and head may be dark red brown.

Head. An antenna clearly more than 1/2 as long as body, outer segments elongated, segments 7–10 each about 1 1/2 times as long as wide, segment 11 about 2 times as long as wide. Vertex with a median, elongated fovea, surface of each side of fovea produced into moderate-sized to small prominences and with fine punctation, moderate in density; vertex also with transverse grooves. Clypeus with very fine punctures and a few large punctures.

Pronotum. Widest apically, width a little greater than length (fig. 67); constriction submedian, width at constriction about 83% of width apically. Surface with very fine punctation, moderate in density; surface also with large punctures, these located anteriorly on each side and also in a longitudinal series on disk. Near basal 1/4, a smooth, broad, shallow, transverse depression with a distinct median pit.

Elytra. Transverse depression clearly indicated above basal 1/3; surface between striae smooth, with weak to no fine punctation and weak development of grooves; 8th interval with a series of fine punctures; 3d stria with 11–13 punctures in basal 1/2 of elytron; 9th stria complete. Elytra moderately elongated, each elytron about 3 times as long as wide.

Ventral Surface. Metasternum nearly impunctate, with only scattered, moderate-sized punctures. Abdomen nearly impunctate, with very fine, sparse punctures; sternites 1–4 with posterior series of moderate-sized punctures; sternite 5 with scattered moderate-sized punctures.

Length. Body 4.7–5.2 mm.

Aedeagus. In lateral view (fig. 116) widest medially, apical tip sharply pointed and clearly inclined downward, upper apical margin convex; in dorsal view widest basally, narrowed anteriorly, apex blunt, small orifice overlaid by 3 lobes, median lobe arcuate and broad basally, portion behind orifice flat; internal processes simple, in dorsal view symmetrical but of no distinctive form.

Type Material

The holotype (USNM) of *O. margineimpressa* bears a label with the data "Arizona; Charles Schaeffer Collection; HS Barber Bequest 1950."

Material Examined

Only six specimens were examined, and they were collected in the following locations. **Arizona**—Santa Rita Mts., Madera Canyon; Douglas; Pima Co.; Ramsey Canyon, Huachuca Mts.

Distribution

This species occurs exclusively in extreme south-central to southeastern Arizona (fig. 70).

Remarks

In addition to the abdominal and length characters given in the key, the form of the pronotum will aid in distinguishing between *O. concolor* and *O. margineimpressa*. The pronotum of *O. margineimpressa* is inflated, is clearly widest anteriorly, and is mostly smooth with only large punctures located medially and anteriorly on each side (fig. 67). The pronotum of *O. concolor* is not inflated, is but slightly widest anteriorly, is finely and coarsely punctate nearly throughout, and is not smooth but irregular. Also, *O. margineimpressa* has a distinct depression near the suture at about the basal one-fourth of each elytron. *Oulema concolor* may or may not have a weak indication of transverse depression basally on each elytron.

Oulema melanopus (Linnaeus)

(figs. 38, 48, 54, 55, 78, 117)

Chrysomela melanopus Linnaeus, 1758:376.

Crioceris melanopus (Linnaeus), Fabricius, 1775:121 (taxonomy).

Lema melanopa (Linnaeus), Dejean, 1821:115 (world checklist); Dejean, 1835:360 (world checklist); Dejean, 1837:387 (world checklist); Suffrian, 1841d:101 (taxonomy); Suffrian, 1846:154 (taxonomy); Lacordaire, 1845:393 (taxonomy); Gemminger and Harold, 1874:3257 (world catalog); Jacoby and Clavareau, 1904:5 (world catalog); Clavareau, 1913:70 (world catalog); Hodson, 1929:5 (bionomics); Venturi, 1942:11 (adult and larval morphology, biology, references); Grensted, 1946:144 (nomenclature); Sengupta, 1957:472 (hosts); U.S. Department of Agriculture, 1958:47 (habits, not in United States).

Lema atrata Waltl, 1835:81 (preoccupied by *atrata* Fab., 1801:474).

Lema waltli Heinze, 1927b:141 (replacement for *atrata* Waltl).

Oulema melanopus (Linnaeus), Des Gozis, 1886:33; Monros, 1960:224 (world checklist); Favinger, 1962:2 (new in N. Amer.); Science News Letter, 1962:133 (new in United States); Science News Letter, 1963:83 (habits, chemical control, biology, spread); Favinger and Moussa, 1963:167 (history in United States, host range, economic importance, life history); Castro et al., 1965:623 (natural history in Michigan); Ruppel and Smith, 1965:936 (sound production); Wilson and Shade, 1966:170 (larval survival and development); Myser and Schultz, 1967:1329 (sexing adults); Wellso et al., 1970:85 (selected bibliography); Wellso et al., 1972:558 (inheritance of a dark mutant); U.S. Department of Agriculture, 1972:343 (selected references); Wilson et al., 1972:371 (infestation of oats); Miczulski, 1973:70 (sexing adults); Wilcox, 1974a:6 (N. Amer. checklist); Wilcox, 1974b:14 (N. Amer. checklist); Wilcox, 1979:6 (hosts); Petitpierre, 1980:180 (chromosome study); Batra et al. 1981:36 (on thistle); Haynes and Gage, 1981:259 (history in N. Amer.); Battenfield et al. 1982:291 (bibliography, references). Berti, 1989:47 (the identity of *O. melanopus*).

Diagnosis

Head, elytra, coxae, trochanters, tarsi, and tibial apices black; pronotum, femora, and most of tibiae orange to red orange.

Description

General. Pronotum, femora, and tibiae (except apices) orange to red orange; head, antennae, elytra, ventral surface, coxae, trochanters, tibial apices, and tarsi black; all black parts of body (except outer 8 antennal segments, apices of tibia, and tarsi) also with a distinct bluish reflection; surfaces shiny.

Color Variation. Anterior and basal margins of pronotum may be narrowly black; sometimes elytral reflection greenish; mandibles often reddish.

Head. An antenna clearly more than 1/2 length of body; outer segments elongated, segments 7 and 11 each about 2 times as long as wide, segments 8–10 each less than 2 times as long as wide. Vertex with a distinct, median groove; surface weakly convex to flat and densely punctate, punctures variable in size (figs. 54–55). Clypeal area with dense punctation and with setae obscuring surface.

Pronotum. Width and length subequal, widest medially; constriction located at basal 1/4, width at constriction 88% of medial width; medially at basal 1/4, with or without a small fovea; large, not dense, irregular punctures at sides extending anteriorly to middle, on disk extending to near base; at basal 1/4, a coarsely punctate transverse depression; surface also with sparse, very fine punctures.

Elytra. At basal 1/4, a weak to no depression; intervals between striae with weak development of fine punctures and transverse grooves; infrequently in basal 1/4, large punctures of striae transversely aligned; 3d stria with 13–18 punctures in basal 1/2 of elytron; 9th stria complete. Elytra much elongated, each elytron 3.5–3.7 times as long as wide.

Ventral Surface. Metasternum with large punctures, moderate in density, a seta arising from each puncture; large punctures nearly absent medially except along anterior margin; surface also with fine punctures. Abdomen finely scabrous, especially at sides; sternites 1–4 below apex with transverse series of moderate-sized punctures; sternite 5 with scattered moderate-sized punctures.

Length. Body 4.6–5.3 mm

Aedeagus. In lateral view (fig. 117) widest medially, widest point behind declivity, apical tip pointed downward and sharply pointed, lower apical margin broadly sinuate, upper apical margin nearly flat and curved downward apically; in dorsal view sides subparallel basally but narrowed anteriorly, small orifice overlaid by 3 lobes, 2 lateral lobes broadened and concealing median lobe, portion behind orifice flat; internal processes simple, in dorsal view symmetrical but of no distinctive form.

Type Material

Berti (1989:48) found two syntypes of *O. melanopus* in the Linnaeus collection (Linnean Society, Burlington House, Piccadilly, London) and designated a male as lectotype. The genitalia of the species to which we have applied the name *melanopus* agree well with those in the figures given by Berti (pp. 50–51) and not with those of a very similar species. See below for further explanation.

Material Examined

I examined 204 mounted specimens of *O. melanopus*. In addition to these 204 specimens, the USNM has roughly 350 unmounted adults plus numerous larvae of *O. melanopus*. The unmounted adults and larvae were collected during the years of the cereal leaf beetle survey (about 1963–76). Many of the records below are from the unmounted adults; none are from the larvae because of the greater difficulty in identifying these.

The collection localities are as follows. **Canada. Ontario**—Hamilton; Walsingham; Harrow; Aylmer W.; Amherstburg. **Quebec**—Rigaud; Quyon. **Illinois**—Williamson Co.; Tazewell Co.; Shelby Co.; Kankakee Co.; Scott Co.; Will Co. **Indiana**—Starke Co.; Elkhart Co.; Cass Co.; Porter Co.; Jasper Co.; Orange Co.; Ripley Co.; Hamilton Co.; Bartholemew; Union; Fayette; La Porte Co.; nr. Hudson; New Carlisle; La Porte Co. **Kentucky**—Bell Co.; Kenton Co.; Lawrence Co.; Carroll Co.; Trimble Co.; Henry Co.; Grant Co.; Carter Co.; Boone Co.; Cambell Co.; Franklin Co. **Maryland**—Bethesda; St. Charles Co. **Michigan**—Galien; Berrien Co.; Petersburg; Cass Co.; Boston; Lawell; Hamelton; Niles; Clare Co.; Oakland Co.; Wayne Co.; Allegan Co.; Clinton Co.; E. Lansing. **Missouri**—Hazelwood. **New Jersey**—Huntertown; Burlington Co. **New York**—Chantangua; Genesee Co.; Cattartagus Co.; Monroe Co.; Ontario Co.; Tioga Co. **Ohio**—Findlay; Gallia Co.; Pike Co.; Lake Co.; Perry Co.; Medina Co.; Logan Co.; Miami Co.; Wooster; Madison Co.; Van Wert Co.; Franklin Co.; Hocking Co.; Ross Co.; Champaign Co. **Pennsylvania**—Lycomming Co.; Erie Co. **Virginia**—Massanutten Mt.; Craig Co.; Flavan Co.; Giles Co.; Montgomery Co.; Roanoke Co.; Essex Co.; Amelia Co.; Patrick Co.; Fairfax Co. Pr. William Co.; Shenandoa N.P. **West Virginia**—Ohio Co.; Pleasant Co.; Preston Co.; Doddridge Co.; Putnam Co.; Tucker Co.; Marion Co.; Roan Co.; Pendelton Co.; Randolph Co.; Braxton Co.; Harison Co.; Taylor Co.; Wood Co. **Wisconsin**—Mazomamie; Washington Co.

Distribution

This species occurs in Northeastern United States and southern Canada and as far west as Missouri (fig. 78).

Hosts

Adults and larvae of *O. melanopus*, the cereal leaf beetle, feed on leaves of all cereals.

Miczulski (1973:61) studied the bionomics of *O. melanopus* and *O. gallaeciana* in Poland as a direct result of the invasion of the cereal leaf beetle into the United States. The favored host plants for *O. melanopus* are oats, wheat, and barley. Only larval damage to these plants is of economic importance.

Remarks

Since *O. melanopus* is a comparatively recent introduction into North America (first recorded in 1962), it has likely spread farther than indicated by the distribution recorded here and shown in figure 78.

Included in the references above are selected papers on the history, spread, biology, and morphology of the cereal leaf beetle, with a strong emphasis on papers appearing in North American publications. No attempt has been made to include papers that are primarily to exclusively economic in orientation. In their bibliography of this species, Battenfield et al. (1982:291) included roughly 400 references.

No one native species is clearly and closely allied to the introduced *O. melanopus*. The closest relative is probably to be found among the species *O. collaris*, *O. elongata*, and *O. longipennis*. These three species, however, have antennae that are broader than those of *O. melanopus* and do not have the color combination or the pronotal shape of *O. melanopus*. Both *O. collaris* and *O. longipennis* differ from *O. melanopus* in that their legs are dark throughout. Like *O. melanopus*, *O. elongata* has pale femora, but unlike *O. melanopus*, *O. elongata* has dark tibiae and a light-colored head. *Oulema melanoventris* may show as many similarities to *O. melanopus* as do any of the species mentioned above.

The characters presented by Myser and Schultz (1967) as distinguishing the sexes seem to work effectively. They stated that the intercoxal process of the first abdominal segment is flat to concave and slightly pointed in the male but is rounded and convex in the female. I have not found these differences to be pronounced, but with practice I have found them to be usable. The characters are illustrated in dorsal views only by Myser and Schultz and in dorsal and lateral views by Miczulski (1973:64). The narrow intercoxal process is more pronounced in Miczulski's drawing than in that by Myser and Schultz.

Berti (1989:47) published a paper on the identity of *Oulema melanopus* (L.). She recognized *Oulema duftschmidi* (Redt.) as distinct from *O. melanopus*; the former name has been listed as synonymic with *O. melanopus*. This action raises the question as to which of these two species has been introduced into North America. My dissections of three males from Middlesex Co., Virginia, showed that the internal sac of the male genitalia corresponds exactly with the illustrations for *O. melanopus* in Berti (p. 51) and not with those for *O. duftschmidi*.

Berti (1989:48) used the combination *Oulema duftschmidi* (Redtenbacher, 1874:446) for *L. cyanipennis* Duftschmid (preoccupied by *Lema cyanipennis* Fabricius, 1801:472). However, as shown by White (1981:17), *cyanipennis* Duft. was first replaced by *rufocyanea* Suffrian (1847:100). Thus the correct name is *Oulema rufocyanea* (Suff.) and not *Oulema duftschmidi* (Redt.).

Oulema melanoventris
White, New Species
(figs. 43, 74)

Diagnosis

Ninth elytral stria interrupted with a gap of 7 or 8 punctures; ventral surface black; femora mostly orange; length 3.2–6.3 mm; head not tuberculate.

Description

General. Most of both head and prothorax dull red orange, clypeus and labrum black; elytra black with a blue reflection; coxae, sterna, and abdomen black; antennae brown, femora mostly orange, each femur dorsally before apex more or less marked with brown; front tibiae orange marked with brown; middle and hind tibiae and all tarsi dark brown. Hind margins of abdominal segments 1–4 narrowly light in color; hind margin of segment 5 more broadly orange. Dorsum shiny; ventral surface moderately shiny, shininess reduced by punctation.

Head. An antenna about 0.7 times as long as body; outer antennal segments elongated, segments 7–11 each about 3 times as long as wide. Vertex with a small median pit, weakly convex; punctation fine and not dense. Clypeus with a large median depression, a few large punctures on each side of depression.

Pronotum. Base and apex subequal in width, width clearly greater than length; constriction submedian, width at constriction about 85% of width apically; surface with moderate-sized punctation located medially at apical 1/2 and apically on each side; surface also with very fine, not dense punctation. At basal 1/3 a transverse depression with a median pit.

Elytra. With a moderately distinct, transverse depression; 3rd stria with 11 punctures in basal 1/2 of elytron; 9th stria with a gap of 7 or 8 punctures; surface between striae smooth, with feeble development of fine punctation and grooves. Elytra elongated, each elytron about 3.2 times as long as wide.

Ventral Surface. Metasternum with moderate-sized, dense punctation, finest on each side; punctures with setae. Abdomen with moderate-sized to small punctation, moderately dense, finest on each side; sides minutely alutaceous.

Length. Body 5 mm.

Type Material

The female holotype and only specimen (CNCI) of *O. melanoventris* I examined bears the label data "6 mi., E. Keremeos, B.C., 22.V.1959, R.E. Leech."

Distribution

Keremeos, British Columbia, is located near the U.S. border (fig. 74).

Remarks

Oulema melanoventris is probably as similar to *O. melanopus* as it is to any North American species. In *O. melanoventris*, the ninth elytral stria has a gap of seven to eight punctures, and antennal segment 5 is about three times as long as wide. In *Oulema melanopus* the ninth elytral stria has no gap, and antennal segment 5 is about two times as long as wide.

***Oulema minuta* White,
New Species**
(figs. 36, 81)

Diagnosis

Length 2.7–3.3 mm; head not tuberculate.

Description

General. Head (except eyes), antennae, prothorax, ventral surface, and legs orange to red orange; elytra black, with or without a bluish reflection.

Color variation. In both specimens examined, labrum darkened, but not black; in 1 specimen antennae darkened. One specimen with all body surfaces dull, not shiny; the other specimen with body dull but elytra shiny.

Head. An antenna clearly more than 1/2 as long as body; segments 7–10 stout, segment 7 about 1.5 times as long as wide, segments 8–10 each a little stouter than previous segment; segment 11 about 1.5 times as long as wide. Vertex with a shallow, median, elongated depression; surface alutaceous, nearly lusterless, with moderate-sized, not dense punctures. Clypeus alutaceous and punctate as is frons.

Pronotum. Base and apex subequal in width; length equal to width in 1 specimen, a little greater than width in other specimen; constriction submedian, width at constriction about 93% of width near apex; large punctures present medially in anterior 2/3 and anteriorly on each side; dense finer punctures also present; surface alutaceous, especially basally; at about basal 1/4, a small, shallow, median pit; no distinct transverse depression.

Elytra. No evidence of a basal transverse depression; surface between punctures of striae with weak punctures and feeble development of grooves or with weak punctures and distinct development of irregular grooves; 9th stria complete. Elytra elongated, each elytron 3.2–3.4 times as long as wide.

Ventral Surface. Metasternum with moderate-sized punctation of moderate density and with very fine punctation. Abdomen with moderate-sized punctation that is moderate in density medially, sparse laterally; surfaces at side nearly lusterless.

Length. Body 2.7–3.3 mm.

Type Material

The holotype and a paratype (FSCA) of *O. minuta* bear the label data “Myakka R. St. Pk., Sarasota Co., Fla., H.V. Weems Coll., 3-IX-54.”

Distribution

This species is known only from west-central Florida (fig. 81).

Remarks

Oulema minuta and *O. texana* are similar in color and morphology. They are most readily separated by body length and head tubercles: *O. minuta* 2.7–3.3 mm, no head tubercles; *O. texana* 3.7–4.3 mm, and head tubercles present. The two species differ also in distributions: *O. minuta* in Florida, *O. texana* in Colorado, Louisiana, Iowa, and Texas.

Oulema palustris
(Blatchley)
(figs. 44, 62, 63, 72, 118)

Lema palustris Blatchley, 1913:22; Leng, 1920:287 (N. Amer. checklist); Leonard, 1928:462 (distribution, host); Frost, 1929:215 (distribution, taxonomy); Schaeffer, 1933:305 (in key); Belkin, 1933:222 (distribution); Blackwelder, 1939:60 (N. Amer. checklist); Hughes, 1944:130 (distribution); Hicks, 1945:214 (distribution, host); Wilcox, 1954:377 (taxonomy); Wilcox, 1974a:7 (N. Amer. checklist); Wilcox, 1974b:8 (Amer. checklist); Wilcox, 1979:9 (host).

Lema palustris floridana Schaeffer, 1933:300; Blackwelder, 1939:60 (N. Amer. checklist); Monros, 1960:229 (world checklist). New Synonymy.

Lema gaspensis Brown, 1938:35; Blackwelder, 1939:60 (N. Amer. checklist); Wilcox, 1974a:7 (N. Amer. checklist); Wilcox, 1974b:8 (Amer. checklist). New Synonymy.

Oulema gaspensis (Brown), Monros, 1960:229 (world checklist).

Oulema palustris (Blatchley), Monros, 1960:229 (world checklist).

Diagnosis

Head distinctly bituberculate between eyes (figs. 62–63), also moderately punctate; legs usually black, shiny.

Description

General. Head, prothorax, and scutellum red to orange red, but labrum and clypeus dark to black; mesosternum and metasternum variable, red or orange, or red clouded with black, or black throughout; antennae and legs usually black; abdomen mostly black and reddish apically; elytra black throughout, nearly always with a bluish reflection. Dorsal surfaces and head shiny throughout; ventral surfaces and legs more or less shiny.

Color Variation. Pronotum sometimes weakly (rarely clearly) clouded with black; when head and prothorax orange, then clypeus and labrum may be weakly clouded with black; sometimes basal antennal segments or apical segment reddish in part. Abdomen may be weakly reddish at tip of 5th segment, or, on other extreme, entire 5th segment may be orange to nearly yellow, with apical margins of other segments reddish to nearly orange. Bases of femora often reddish, sometimes bases of tibiae also reddish; sometimes legs predominantly reddish to orange, with apices of tibiae and tarsi brownish.

Head. An antenna a little more than $1/2$ as long as body; segments 7–10 moderately elongated, each segment a little longer than wide; segment 11 about 2 times as long as wide. Vertex with a median, longitudinal groove, surface on each side of groove quite distinctly produced and with fine and moderate-sized punctation (figs. 62–63). Clypeus with fine and moderate punctation.

Pronotum. Base and apex subequal in width; constriction median, width at constriction about 87% of width at base; surface with fine to large punctation; large punctures located in a patch anteriorly on each side and in a median series at anterior $2/3$, with the series single, irregular, or double; disk with a median pit or groove at basal $1/4$; weak to no transverse depression at basal $1/4$.

Elytra. No to weak indication of a basal depression; surface between striae with no punctation and no to weak development of fine grooves; 9th stria complete. Elytra moderately elongated, each elytron about 2.9 times as long as wide.

Ventral Surface. Metasternum with fine to moderate-sized punctation, most sparse posteriorly. Abdomen with fine, generally sparse punctation, most dense on 5th segment; surface of 5th segment sometimes alutaceous; segments sometimes with moderate-sized punctures in transverse series.

Length. Body 3.6–4.76 mm.

Aedeagus. In lateral view (fig. 118) widest medially, widest point behind apical declivity, apical tip weakly directed downward and sharply pointed, upper apical margin weakly, broadly sinuate; in dorsal view sides widest basally, sides gradually narrowed anteriorly, tip blunt, small orifice overlaid by 3 lobes, median lobe arcuate; internal processes reduced and complex, in dorsal view form somewhat like that of a human figure.

Type Material

The holotype of *O. palustris* (in Purdue University) bears the label data "Steuben Co.; Ind. W.S.B., 6-17-08; Purdue, Blatchley Collection; Type; LECTOTYPE, *Lema palustris* Blatchley, Des. W.S. Blatchley 1930."

Material Examined

I examined 89 specimens collected in the following locations. **Alabama**—Chambers Co.; Tuscaloosa. **District of Columbia.** **Florida**—Fernandina; Indian River. **Illinois**—St. Clair Co. **Indiana**—Steuben Co.; Marshal Co.; Indianapolis. **Iowa**—Iowa city. **Kansas**—Wathena; Riley Co. **Kentucky**—Carrollton. **Louisiana**—Natchitoches Par. **Massachusetts**—Natick. **Maryland**—Baltimore. **Michigan**—Detroit. **Missouri**—Howard Co.; Randolph Co.; Columbia; Mercer Co.; Callaway Co.; Ray Co.; Kansas City; Jefferson Co. **New Jersey**—Avenel; S. Orange, Rahway; Madison; Berkeley Hts. **New York**—Brooklyn; Roslyn L.I.; West Point; Flushing L.I. **North Carolina**—So. Pines. **Oklahoma**—Clinton Co.; Wichita Nat. For. **Ohio**—Columbus; Franklin Co.; Hocking Co. **Pennsylvania**—Glenolden; Easton. **Texas**—Victoria; Brownsville; Wallacy Co. **Virginia**—Glencarlyn; Alexandria Co.; Veitch. **Georgia**—Tybee Isl. **West Virginia**—W. Sulphur. **Wisconsin**—Washington Co. **Canada.** **Ontario**—Prince Edward Co.; Ojibway; Roseland.

Distribution

Oulema palustris occurs nearly throughout Eastern United States and into Canada and southern Texas (fig. 72).

Hosts

Biological notes from label data follow: On *Tradescantia* sp.; on Canada thistle; sweeping Canada thistle; eating leaf of *Carduus altissimus*; on Calla lily blossom; on potato leaf; on morning glory leaf. The following are literature notes: On leaves and stems of *Cirsium* (Hicks 1945:214); host *Cirsium arvense* (L.) (Wilcox 1979:9).

Remarks

Oulema palustris and *O. brunnicollis* are quite similar in external morphology. They are best distinguished by head characters. The head of *O. brunnicollis* has fine punctation and is not shiny because of a finely colliculate surface. The head of *O. palustris* has moderate-sized punctation and is shiny, not colliculate. The length of *O. brunnicollis* is 4.2–5.1 mm while that of *O. palustris* is 3.6–4.7 mm. In addition, *O. brunnicollis* has smaller frontal tubercles than *O. palustris*; has large and dense pronotal punctation, usually with a double row along the midline and in patches at sides; and occurs only in Florida and Alabama. In contrast, *O. palustris* has larger frontal tubercles than *O. brunnicollis*; has usually small, not dense pronotal punctation along the midline and at sides; and is widely distributed—from the New England States to Florida to the Midwest.

Schaeffer (1933:300) described *L. palustris floridana* on the basis of the following characters: “Antennal joints narrower and more elongate and the elytra bright green.” Two USNM specimens bear the following data: “Enterprise, Fla.; Charles Schaeffer Collection; HS Barber Bequest 1950.” The first of these specimens bears the identification label “*L. palustris floridana* Schffr.” I hereby designate and have labeled this specimen as lectotype. The color differences given by Schaeffer as distinguishing his subspecies *floridana* are of little significance: the syntype shows a weak green luster, the lectotype a weak blue luster. Other Florida specimens of *O. palustris* that I have seen show a weak or no blue luster. The specimens of *O. palustris* in the series I examined do exhibit differences in the extent of elongation of the outer antennal segments. The stoutest antennae are found in specimens from the northeastern part of the range. Antennal segments tend to be more elongated in specimens from other parts of the range, the tendency being greatest in specimens from the southern part of the range. I cannot maintain *O. p. floridana* as a subspecies on the basis of these differences.

I examined the external morphology and male genitalia of the holotype of *O. gaspensis*, which bears the label data “Mt. Albert. Que., 3000–3250 ft., 20–7–1933, W.J. Brown; HOLOTYPE *Lema gaspensis* Brown, No. 3645.” I found almost no distinctive differences between the external morphologies of *O. gaspensis* and *O. palustris*. The latter is a widely ranging and variable species, and nearly all characters of *O. gaspensis* fall within the range of variation of the *O. palustris* characters. Of the external characters, only the color of the prothorax of the type of *O. gaspensis* is unique. The prothorax is very dark red brown throughout. Although this color is not matched by that of any specimens of *O. palustris*, some specimens do show partial darkening of the prothorax. As mentioned by Brown, the antennae of *O. gaspensis* are stout; however, the dimensional character of the antennal segments is variable in *O. palustris*. Specimens of the latter from Northeastern United States have similarly stout antennae. I compared the male genitalia of the type of *O. gaspensis* with those of *O. palustris* and found no differences. It appears to me that *O. gaspensis* is just a variant of *O. palustris*, so I have synonymized the two.

As noted by Frost (1929:215) there has been some confusion between the species *O. palustris* and *O. brunnicollis*. Not only has *O. palustris* been misidentified as *O. brunnicollis*, but in some publications previous to 1913, *O.*

brunnicollis was the name used for this species. I have seen specimens of *O. brunnicollis* from Florida and Alabama only. This distribution suggests that the species also occurs in Georgia, but any records of it north of Florida and Alabama are highly suspect and most likely refer to *O. palustris*. For example, the collection records of this species by the following researchers are almost certainly in error: Dury (1879, Cincinnati), Smith (1890, 1900, New Jersey), Johnson (1927, Maine), and Procter (1938, Maine).

***Oulema sayi* (Crotch),
New Combination**
(figs. 30, 66, 69, 76, 119)

Lema sayi Crotch, 1873a:26; Crotch, 1873b:94 (N. Amer. checklist); Donckier de Donceel, 1885:9 (world catalog); Henshaw, 1885:105 (N. Amer. checklist); Richardson, 1893:240 (biology); Ulke, 1902:27 (distribution, host); Jacoby and Clavareau, 1904:15 (world catalog); Schoemaker, 1910:135 (distribution); Blatchley, 1910:1111 (taxonomy); Clavareau, 1913:77 (world catalog); Leng, 1920:287 (N. Amer. checklist); Rosewell, 1922:178 (host); Dozier, 1922:117 (distribution); Schaeffer, 1933:305 (in key); Brimley, 1938:221 (distribution); Blackwelder, 1939:60 (distribution); Hughes, 1944:130 (distribution); Löding, 1945:126 (distribution); Fattig, 1948:5 (distribution); Wilcox, 1954:377 (taxonomy); Monros, 1960:222 (world checklist); Balsbaugh and Hays, 1972:21 (taxonomy); Wilcox, 1974a:7 (N. Amer. checklist); Wilcox, 1974b:8 (Amer. checklist); Wilcox, 1979:8 (hosts).

Diagnosis

Ninth elytral stria with a gap of 3–8 punctures; ventral surface orange to red; legs black; length 4.4–5.5 mm.

Description

General. Most of head, prothorax, and ventral surface orange to orange red; mouthparts anteriorly black and usually a spot on frons black; palpi orange to yellow; disk of pronotum often with a black spot or spots; antennae, legs, and elytra black; elytra sometimes with a bluish to greenish reflection. Surfaces, excluding pronotum and ventral surface, shiny; pronotum shininess somewhat to distinctly obscured by punctation and sculpturing (fig. 6); punctation obscuring shininess of ventral surface.

Color Variation. Apices of antennal segments 1 and 2 may have red; clypeus usually light but may be more or less darkened; dark spot on frons, when present, occupies just median depression, but at its largest, nearly reaches lateral, diagonal sulci; dark markings on pronotum vary from 1, 2, or 3 small spots within anterior 1/2 of pronotum to, at greatest extent, 1 large spot occupying most of anterior 2/3 of disk; legs may be more or less red brown to dark brown.

Head. An antenna clearly more than 1/2 as long as body; outer segments elongated, segments 7–11 each about 2 times as long as wide. Vertex usually with a short, longitudinal groove or depression; surface each side weakly convex and with fine punctation, variable in density. Clypeus with fine and moderate-sized, dense punctation.

Pronotum. Base slightly wider than apex, width a little greater than length (fig. 69); constriction submedian, width at constriction about 83% of width at base; at basal 1/4, with or without a weak, longitudinal, median groove, always with a weak, transverse depression; surface with dense, fine and moderate-sized punctation obscuring reflectivity.

Elytra. Lacking or with feeble indication of basal depression; surface smooth or not, with feeble development of fine punctation and with weak to moderate development of transverse grooves; 3d stria with 13–17 punctures in basal 1/2 of elytron; 9th stria with a gap of 2–8 punctures. Elytra moderately elongated, each elytron 3.2–3.4 times as long as wide.

Ventral Surface. Metasternum with dense, moderate-sized punctation, nearly absent medially at base; punctures bearing short setae. Abdomen throughout with dense, moderate-sized punctation, most dense at sides; punctures bearing very short setae.

Length. Body 4.4–5.5 mm.

Aedeagus. In lateral view (fig. 119) widest medially, apical tip pointed and directed forward, upper apical margin convex; in dorsal view sides subparallel at basal 1/2, and narrowed apically, moderate-sized orifice overlaid by 3 lobes, median lobe weakly arcuate and broad basally; internal processes complex, in dorsal view symmetrical.

Type Material

The holotype of *O. sayi* (MCZC) bears “no. 5036,” and the datum “D.C.”

Material Examined

The specimens examined number 311, and they were collected in the following locations. **Arkansas**—Mississippi Co.; Lincoln Co. **District of Columbia.** **Florida**—Liberty Co.; Jackson Co.; Gainesville; Jacksonville. **Georgia**—no locality given. **Louisiana**—Boothville; Lockport; Buras; Venice; Opelousas; Iberville Par., St. Gabriel Exp. Sta.; E. Baton Rouge Par. **Maryland**—Cabin John; Forest Glen; Glen Echo; Baltimore; Ellicott; Anne Arundel Co.; Prince Georges Co.; Plummers Isl.; Cecil Co.; College Park. **Mississippi**—Ag. Coll. Corinth. **Missouri**—Moberly; Columbia; Louisiana; Stoddard Co.; Vernon Co.; St. Louis Co. **New Jersey**—Moorestown. **North Carolina**—Bryson City; Wake Co.; L. Junaluska. **Ohio**—Lawrence Co. **South Carolina**—Ridgeland; Clemson College. **Tennessee**—Nashville; Elmwood; Greater Smoky Mts.; Greenbrier; Vonore. **Virginia**—Fredericksburg; Suffolk; Rosslyn; Vienna; Falls Church; Greene Co.

Distribution

This species occurs nearly throughout Southeastern United States and into New Jersey and eastern Texas (fig. 76).

Hosts

Label data follow: On *Carex* sp. leaves; on grass; on sugarcane leaf; on snap bean foliage; on *Rubus* sp. foliage; on sweet potato leaves; on orange leaves; *Commelina*; host *Commelina communis*. The following are literature notes: In and on *Commelina* [sic] *virginica* (Richardson 1893:240); in *Tradescantia virginiana* (Blatchley 1910:1111); from yellow thistle (Rosewell 1922:178). Wilcox (1979) recorded the following as hosts: p. 9, *Citrus sinensis* (L.) (orange); p. 12, Gramineae (a grass); p. 14, *Ipomoea batatas* (L.); p. 17, *Phaseolus vulgaris* L., (string bean); p. 20, *Rubus* sp. (bramble); p. 21, *Saccharum officinarum* L. (sugarcane).

Remarks

Oulema sayi is most closely related to *O. arizonae*; for a discussion of the differences, see under the latter species.

***Oulema simulans*
(Schaeffer),
New Combination**
(figs. 35, 56, 57, 73, 120)

Lema simulans Schaeffer, 1933:300; Blackwelder, 1939:60 (N. Amer. checklist); Kaufmann, 1967:363 (larval description, larval key, host); Monros, 1960:213 (world checklist); Wilcox, 1974a:7 (N. Amer. checklist); Wilcox, 1974b:9 (Amer. checklist).

Diagnosis

Femora entirely orange to red; base of tibiae orange to red with remainder of legs black; head moderately bituberculate.

Description

General. Most of head, prothorax, ventral surface, and base of legs orange to red orange; mouthparts black anteriorly; antennae, most of tibiae, tarsi, and elytra black; elytra often with a bluish reflection. Dorsal surfaces shiny; ventral surface with shininess obscured by punctation.

Color Variation. Antennae often brown to red brown, sometimes last segments lighter than others; most of tibiae and tarsi brown to red brown; sometimes elytra red brown.

Head. An antenna clearly more than 1/2 as long as body; outer segments elongated, segments 7–11 each roughly 2 times as long as wide. Vertex with a distinct longitudinal depression (figs. 56–57); surface each side moderately produced and with fine punctation, moderate in density. Clypeal area with fine and coarse punctation, moderate in density.

Pronotum. Base and apex subequal in width, width a little greater than length; constriction submedian, width at constriction about 86% of width at base; medially at basal 1/4, with or without a weak longitudinal groove, always with a weak transverse depression. Surface with a longitudinal series of moderate-sized punctures from anterior margin to past middle, and with moderate-sized punctures on anterior of each side; also with fine punctation, moderate in density.

Elytra. Lacking basal depression; surface between striae smooth, with feeble development of fine punctation and little to no evidence of transverse grooves; 3d stria with 13–15 punctures in basal 1/2 of elytron; 9th stria complete. Elytra elongated, each elytron about 3.5 times as long as wide.

Ventral Surface. Metasternum with fine to moderate-sized punctation, most dense anteriorly at sides, nearly absent medially, each puncture bearing a short seta. Abdomen with moderate-sized punctation nearly throughout, most dense at sides; punctures bearing very short pubescence, latter moderate in density.

Length. Body 4.6–6.0 mm.

Aedeagus. In lateral view (fig. 120) widest medially, widest point behind apical declivity, apical tip inclined downward and sharply pointed, upper apical margin nearly straight but convex below apex; in dorsal view sides gradually narrowed apically, orifice tiny and overlaid by 3 lobes, median lobe truncate, portion behind orifice nearly flat; internal processes complex, in dorsal view symmetrical, not in form of a human figure.

Type Material

The holotype (USNM) of *O. simulans* bears the label data "Medic. Ldg., VII. Kans.; Charles Schaeffer Collection; HS Barber Bequest 1950; *L. simulans* Schffr."

Material Examined

The number of specimens examined is 136; they were collected in the following locations. **Arkansas**—Fayetteville. **Illinois**—Havana; 5 mi. S. Bath. **Kansas**—Manhattan; Riley Co.; Kiowa Co.; Medora; Miltonvale, Cloud Co.; Macdona; Seabrook. **Louisiana**—Natchitoches Par.; Kisatchie Nat. For. **Missouri**—Osage Co.; Columbia; Gasconade Co.; 5 mi N. Bloomsdale; Pevely, Cedar Co.; St. Francois Co.; Jefferson Co. **Oklahoma**—Muskogee. **Texas**—Corpus Christi; Harris Co.; Columbus; Cuero; Victoria; Karnack; Tatum; Seabrook.

Distribution

Oulema simulans occurs from Central United States to Texas (fig. 73).

Hosts

Label data give *Commelina* as host. Kaufmann (1967:363) reported the host as *Commelina erecta* L.

Remarks

Oulema simulans typically bears moderately developed interantennal tubercles; and at couplet 5 of the key, most specimens run to couplet 6 then to couplet 9. However, a few specimens have weakly developed tubercles, so these can run in the key to *O. variabilis*. Specimens of *O. simulans* with weak tubercles are markedly similar in virtually every character to, and can therefore be quite difficult to distinguish from, specimens of *O. variabilis*. One character of some value in distinguishing between these species is the relative lengths of the antennal segments. In most specimens of *O. simulans* the third antennal segment is clearly shorter than is the fourth, but in *O. variabilis* the third antennal segment is nearly the same length as the fourth antennal segment.

Oulema simulans is also quite similar to *O. cornuta* (for a discussion of the differences, see under the latter species) and to *O. elongata* (see under *O. elongata* for the differences).

***Oulema texana* (Crotch),
New Combination**
(figs. 42, 64, 65, 82, 121)

Lema texana Crotch, 1873a:25; Crotch, 1873b:94 (N. Amer. checklist); Donckier de Donceel, 1885:9 (world checklist); Henshaw, 1885:105 (N. Amer. checklist); Slosson, 1893:150 (distribution, host; record in error?) Snow, 1903:198 (distribution); Jacoby and Clavareau, 1904:15 (world catalog); Clavareau, 1913:80 (world catalog); Leng, 1920:287 (N. Amer. checklist); Blatchley, 1924:39 (distribution, host; record in error?); Douglass,

1929:4 (distribution); Schaeffer, 1933:305 (in key); Blackwelder, 1939:60 (N. Amer. checklist); Blackwelder, 1946:632 (Amer. checklist); Monros, 1960:213 (world checklist); Wilcox, 1974a:7 (N. Amer. checklist); Wilcox, 1974b:9 (Amer. checklist).

Lema coloradensis Linell, 1897:475; Wickham, 1902:284 (distribution); Jacoby and Clavareau, 1904:15 (world catalog); Clavareau, 1913:59 (world catalog); Leng, 1920:287 (N. Amer. checklist); Brisley, 1928:117 (in key); Schaeffer, 1933:305 (in key); Blackwelder, 1939:60 (N. Amer. checklist); Wilcox, 1974a:7 (N. Amer. checklist); Wilcox, 1974b:8 (Amer. checklist).

Oulema coloradensis (Linell), Monros, 1960:229 (world checklist).

New Synonymy.

Diagnosis

Head distinctly bituberculate; legs primarily orange to red, tarsi often dark.

Description

General. Head and prothorax red to orange red; legs predominantly orange, but tarsi mostly brown; metasternum orange to mostly black; abdomen black (except for orange apex) to mostly orange with base dark; antennae largely black; elytra black and usually with a bluish reflection. Body surfaces shiny throughout.

Additional Color Variation. Labrum often darkened; pronotum sometimes clouded with brown on each side; femora and tibiae sometimes clouded with brown, infrequently predominantly brown to nearly black.

Head. An antenna a little over 1/2 as long as body; outer segments broad, 7th segment a little longer than wide, segments 8–10 each about as wide as long, segment 11 about 1 1/2 times as long as wide. Vertex distinctly produced each side of middle (figs. 64–65), medially with a longitudinal groove, surface with fine punctation, moderate in density. Clypeus with fine punctures that are moderate in density and with 2 large punctures.

Pronotum. Apex and base about equal in width, width a little greater than length; constriction submedian, width at constriction about 90% of width at base; surface with moderately dense punctation, fine and large, large punctures forming a median series on disk; medially at basal 1/4, a distinct pit; basally lacking a distinct transverse depression.

Elytra. With or without feeble, basal transverse depression; 3d stria with 9–13 punctures in basal 1/2 of elytron; 9th stria complete; surface between punctures smooth or with weak development of grooves. Elytra moderately elongated, each elytron about 3 times as long as wide.

Ventral Surface. Metasternum with fine punctation, sparse, to moderate in density. Abdomen with mostly fine, sparse punctation; punctation most sparse on sternite 1, more or less transversely aligned on sternites 1–4, most dense on sternite 5.

Length. Body 3.7–4.3 mm.

Aedeagus. In lateral view (fig. 121) widest medially, widest point behind apical declivity, apical tip pointed and inclined downward, upper apical margin weakly convex; in dorsal view widest medially, orifice tiny and overlaid by 3 lobes, median lobe truncate and nearly concealed by lateral lobes, portion behind orifice flat; internal processes complex, in dorsal view symmetrical and of no distinctive form.

Type Material

The holotype (MCZC) of *O. texana* bears labels that state: "Tex.; 883; J.L. LeConte Coll.; Type, 5038; J. LECONTE COLLECTION; *L. texana* Crotch." The type is the first of five syntypes, and the only one with a determination label. All five specimens bear a type label and the number listed fourth above.

Material Examined

I examined 16 specimens that were collected in the following locations.

Colorado—Greeley. **Iowa**—Lake Okoboji. **Louisiana**—Boothville; Dalebur. **Texas**—Brownsville; Kingsville, Kleberg Co.; Victoria.

Distribution

Specimens of *O. texana* have been collected in southern Texas, Louisiana, Iowa, and Colorado (fig. 82).

Hosts

Label data follow: On *Carex* sp. leaves; on Johnson grass leaf. Slosson (1893:150) reported, "on butterfly pea."

Remarks

Through most of the history of its use, the name *O. texana* was misapplied to a species actually undescribed and here named *O. variabilis*. Due to the confusion, doubt exists as to which of the above references actually refer to *O. texana* and not to *O. variabilis*.

The occurrence of *O. texana* in Florida, as reported by Leng (1920:287), Slosson (1893:150), and Blatchley (1924:39), is questionable, and I cannot confirm it. But judging by its known distribution, the actual *O. texana* is more likely than *O. variabilis* to occur in Florida, the latter species being known only from southern Texas to southern Arizona.

Oulema texana (Crotch) was originally described from a composite series of five specimens representing three species. The type is the same species described as *Lema coloradensis* by Linell in 1897, so *O. coloradensis* becomes a synonym of *O. texana*. One specimen in the type series is *O. variabilis*, and three are *O. simulans*.

***Oulema variabilis* White,**
New Species
(figs. 34, 75, 123)

Lema texana Auctorum (not Crotch).

Diagnosis

Ventral surface and most of legs orange to red; length 4.0–5.2 mm; head not tuberculate; elytra unicolorous.

Description

General. Most of head, prothorax, ventral surface, and base of legs orange to red orange; mouthparts anteriorly black; antennae, most of tibiae, and sometimes elytra black; elytra often red brown and often with bluish reflection; apex of tibiae, tarsi more or less brown. Dorsal surfaces shiny; shininess of ventral surface reduced by punctation.

Color Variation. Elytra vary from dull light red brown to black, usually with a bluish reflection; antennae sometimes mostly dark brown, with apex of 7th segment and 11th segment red brown; rarely entire body dull red brown, antennae mostly dark brown, and legs orange.

Head. An antenna clearly more than 1/2 as long as body; outer segments elongated, segments 7–11 each roughly 2 times as long as wide. Vertex with a longitudinal depression, or fovea; surface of each side weakly convex and finely punctate. Clypeus with fine and coarse punctation.

Pronotum. Width a little greater than length; base and apex subequal in width; constriction submedian, width at constriction 85%–90% of width at base; medially at basal 1/4, a weak transverse depression often lacking a groove or fovea; surface with a longitudinal, median series of punctures from anterior margin to past middle, also with moderate-sized punctures on each side anteriorly and sparse, very fine punctures throughout.

Elytra. Lacking a subbasal depression; surface between striae smooth, with weak to feeble development of fine punctation and transverse grooves; sometimes with large punctures of striae transversely aligned in basal 1/4; 3d stria with 13–16 punctures in basal 1/2 of elytron; 9th stria usually complete, sometimes with a gap of up to 2 punctures. Elytra elongated, each elytron about 3.5 times as long as wide.

Ventral Surface. Metasternum with dense, moderate-sized punctures throughout, each puncture bearing a short seta; abdomen throughout with dense, moderate-sized punctures, these bearing very short setae.

Length. Body 4.0–5.2 mm.

Aedeagus. In lateral view (fig. 123) widest basally, apical tip inclined downward and somewhat blunt, upper apical margin convex apically; internal processes simple, in lateral view appearing spiraled.

Type Material

I examined the holotype and 87 paratypes of *O. variabilis*. Complete label data are quoted below.

Type material

Holotype (USNM)

39 paratypes (USNM)

Label data

Esprza Rch., Brownsville, Tex., VII-28;
Brooklyn Mus. Colln., 1929.

11	Esprza Rch., Brownsville, Tex. [dates from July to August 24]; 7 also have "Brooklyn Museum Collec- tion"; 5 have "Charles Schaeffer Collection, H.S Barber bequest"].
3	Tex.; From Coll. USNM; Collection F. Knab
4	Tex.; Collection C.V. Riley.
2	U.S.A., Texas; F. Monros Collection, 1959.
1	San Diego, 25-10, Tex.; Coll. Hubbard & Schwarz.
1	On String Beans, Winter Haven, Tex., 29-X-43-1870.
1	Wades, 22-5 Tex.; Hubbard & Schwarz.
1	Texas. Tex.; Coll. F.H.Chittenden.
2	Hibernating at stem roots of sedge grass; Sandy soil; Victoria, Tex. 12-14-15; J. Michell Collector.
3	On <i>Commelinia</i> [sic] <i>crispa</i> flowers, Brownsville Tex. VI-2-45-13023.
1	Cotulla, 11 May 06, Tx.; J.C. Crawford collector.
1	Tex: Brownsville, 3:VIII:1971, Scott, coll.
1	Texas, Kerrville, 5 June, 1956, O.L. Cartwright; sweeping grass and weeds.
2	TX. Chambers Co., May 31-78, In rice field; B.E. Gale, #78-8961.
1	Victoria, 5-21-[undecipherable], Tx.; sweeping herbage; Collector J.D. Mitchell.
1	Tex., Starr Co., 5 mi. W. Sullivan City, II-IV-1972, G.H. Nelson; Sweeping roadside vegetation.
1	<i>Eupatorium wrightii</i> , Chisos Mts., Big Bend, Tex., Houston-5651, 8-1-49, 49-19139.
1	Tex.; Charles Schaeffer Collection; H.S. Barber Bequest, 1950.
1	Brownsville Tex; Brownsville Texas.

17 paratypes (OSUC unless otherwise indicated)

3	Round Mt., Tex.; H.W. Wenzel Collection.
---	--

*Type material**Label data*

2	Davis Mts., VIII-22-36, Tex., J.N. Knull.
1	Brownsville, T-25-34, Tex., J.N. Knull.
1 (USNM)	Brownsville, VI-1-34, J.N. Knull.
1	Macdona, VII-28, Tex.; H.A. Wenzel Collector; H.W. Wenzel Collection.
1	Gillespie Co., V-7-46, Tex.; D.J. & J.N. Knull Collrs.
1	Goliad Co., IV-10-50, Tex.; D.J. & J.N. Knull Collrs.
1	Uvalde Co., VIII-25-47, Tex.; D.J. & J.N. Knull Collrs.
1	Webb Co., V-22-48, Tex.; D.J. & J.N. Knull Collrs.
1	7 mi. N. Sinton, IV-15-61, Tex.; D.J. & J.N. Knull Collectors.
1	Lk. Corpus Christi Tex., III-25-53; D.J. & J.N. Knull Collrs.
1	Davis Mts., VI-25-59, Tex.; D.J. & J.N. Knull Collrs.
1 (USNM)	Davis Mts., VII-3-55, Tex.; D.J. & J.N. Knull Collrs.
1 (USNM)	Hidalgo Co., IV-11-61, Tex.; D.J. & J.N. Knull Collrs.

13 paratypes (CASC unless otherwise indicated)

7 (6 CASC, 1 USNM)	Olmes Pk., S. Antonio, VII-6-41, Tex; B.E. White Collector.
1	San Antonio, Tex. VI-42; E.S. Ross.
2 (1 CASC, 1 USNM)	Macdona, VII-29, Tex; 1 J.W. Green Collector.
1	Gilchrist, Tex., V.15.1951, Bryant, Lot 54.
1	Oklahoma, Rt. 62 Okfuskee Co., 10 mi. west of Okemah. 7-11-74, PSB.
1	Silver Creek, Cochise Co.; Chiricahua Mts., Ariz. 45-6000 ft., Oct. 7, 1927; J.A. Kusche Collector.

4 paratypes (FDA)

3	Arizona: Santa Rita Mts., Madera Cyn. [Two of these have "May 19, 1968"; 1 has "July 21, 1969."]
1	Arizona, Pajarito Mts., Pena Blanca Cyn., 15 Aug. 1970, K. Stephan coll.

<i>Type material</i>	<i>Label data</i>
2 paratypes (CNCI)	
1	Kerrville, Tex., April 18, 1959.
1	Big Bend Nat. Pk., Tex., Tornillo Flat, 3200', May 5, 1959, Howden & Becker.
1 paratype (EGRC)	Frio Co., Texas, 2 mi. N. Pearcell, 8 May, 1976, Coll. D.D. Kopp.
3 paratypes (EGRC)	TX: Wallacy Co., 1 mi. S. Kennedy, Co. Line on hwy. 77, X-8-84: E.G. Riley.
7 paratypes (TAMU unless otherwise indicated)	
1	San Antonio, Bexar Co., Tex., V-7-58; J.F. Lawrence Collector.
1	Brownsville, Texas, June 21, 1969, Board & Hafernik.
1	Same as above but with date of June 28.
1	TEXAS: Cameron Co., Mercedes, Jan. 23-24, 1974, S. Moody; leaf litter under hackberry tree.
1 (USNM)	TEXAS: Gonzales Co., Palmetto St. Pk., April 15, 1972; J.C. Schaffner.
1	TEXAS: San Patricio Co., 2 miles south Sinton, June 10, 1971, W.E. Clark.
1 (USNM)	TEXAS: Jeff Davis Co., 2.3 mi. W. Davis Mts., State Park on SR 118, Limpia Cyn. 18-VIII-1974, H. Greenbaum.

Material Examined

There were 87 specimens examined, and they were collected in the following locations. **Arizona**—Cochise Co.; Santa Rita Mts.; Pajarito Mts. **Oklahoma**—Okfuskee Co. **Texas**—Brownsville; San Diego; Winter Haven; Wades; Victoria; Kerrville; Chambers Co.; Starr Co.; Big Bend; Round Mt.; Davis Mts.; Macdona; Gillespie Co.; Goliad Co.; Uvalde Co.; Webb Co.; N. Sinton; Lk. Corpus Christi; Hidalgo Co.; San Antonio; Gilchrest; Frio Co.; Wallacy Co.; Cameron Co.; Gonzales Co.; San Patricio Co.; Jeff Davis Co.

Distribution

Oulema variabilis occurs from Oklahoma and southern Texas to Arizona (fig. 75).

Hosts

Label data follow: On string beans; hibernating at stem roots of sedge grass; in rice field; on *Commelinia* [sic] *crispa* flowers; *Eupatorium wrightii*.

Remarks

Oulema variabilis has often been referred to in past literature as *Lema texana*.

Oulema variabilis is most similar to *O. simulans* and *O. cornuta*, but it can be distinguished from them by the form of the head. In both *O. simulans* and *O. cornuta* the head is most often moderately bituberculate; in *O. variabilis* the head is not bituberculate.

The species name *variabilis* refers to the variable elytral coloration. The elytra vary from black with a bluish reflection to red brown throughout with no bluish reflection. Most specimens have at least some indication of a blue reflection on the elytra.

Reduction of elytral melanism occurs in a number of species of *Oulema*, including *O. arizonae*, *O. cornuta*, and *O. simulans*, but is most marked in *O. variabilis*. A few specimens have dark elytra with only a hint of brown showing, but a majority have elytra that are weakly to quite distinctly brownish or reddish. In specimens with the lightest colored elytra, the elytral color closely matches the color of the head and pronotum.

I examined a single (USNM) specimen (taken at Salmon, Anderson Co., Texas) that I have labeled "*Oulema* unknown species nr. *variabilis*, new?" The specimen runs in the key to *O. variabilis* but is evidently distinct from it. Whereas antennal segments 8–11 are each about 2 times as long as wide in *O. variabilis*, the segments are each about as long as wide in the unknown species, thus the antennae of the latter are similar in form to those of *O. elongata*. In addition, *O. variabilis* has the ventral surface red to orange throughout; the unknown species has the abdomen brown and the metasternum brown orange. Also, *O. variabilis* has tibiae that are red to orange at the base, but mostly brown to black; the unknown species has tibiae that are primarily brown, but brown orange on the inner surface of the anterior tibiae.

***Crioceris* Müller**

Crioceris Müller, 1764:xiii; Lacordaire, 1845:546; Clark, 1866: 37; Lacordaire and Chapuis, 1874:546; Gahan, 1900:451; Jacoby and Clavareau, 1904:26; Blatchley, 1910:1112; Clavareau, 1913:40; Leng, 1920:287; Lucas, 1920:208; Brisley, 1928:116; Chagnon, 1937:226; Blackwelder, 1946:628; Wilcox, 1954:376; Monros, 1960:175; Gressitt and Kimoto, 1961:38; Selman and Smith, 1967:116; Arnett, 1968:905; Balsbaugh and Hays, 1972:17; Wilcox, 1974a:12; Wilcox, 1974b:11; Seeno and Wilcox, 1982:27. Type species, *Chrysomela asparagi* Lin., 1758. Fixed by the International Commission on Zoological Nomenclature (Bulletin of Zoological Nomenclature 1970).

Crioceris Geoffroy, 1762:237 (nomen nudum).

Pleurophora Chevrolat, 1837:385.

Pseudolema Jacoby, 1903:82 (subgenus). Type species, *Pseudolema suturalis* Jacoby.

Description

General

Length 4.7–6.6 mm. Basal color of dorsum yellow to orange; elytra with black spots or with black sutural stripe and spots that may be joined, latter pattern variable in development. Ventral surface orange and black, or black throughout.

Head

An antenna a little less than 1/2 as long as body, slightly expanded apically. Vertex weakly produced or not, with a median, longitudinal groove; frontal grooves shallow and forming an X pattern. Eyes with a short to moderately deep, acute notch. Head moderately or strongly constricted behind eyes.

Pronotum

Width about equal to length; sides arcuate, with feeble to no constriction near base; surface with fine to moderate punctures nearly throughout.

Elytra

With 10 striae readily discernable or weak apically on disk; sutural stria distinct and about 1/4 length of elytra; elytral width about 2/3 to nearly 1/2 of length.

Ventral Surface

Tarsal claws divergent, separated basally.

Key to Species of *Crioceris*

1. Head and much of elytral disk dark metallic blue, elytra also with light markings (fig. 5) *asparagi* (L.)
Head and most of elytra orange to red orange, each elytron with 6 (rarely 5) black spots (fig. 4) *duodecempunctata* (L.)

Crioceris asparagi (Linnaeus) (figs. 5, 71, 87)

Chrysomela asparagi Linnaeus, 1758:376.

Crioceris asparagi (L.), Fabricius, 1775:121 (taxonomy).

Crioceris campestris Rossi, 1790:107.

Lema asparagi (fab.), Suffrian, 1841c:67 (5 pp., general data); Suffrian, 1843:122 (general data).

Crioceris asparagi fab., Lacordaire, 1845:590 (description, discussion); Suffrian, 1846:156 (general data); Fitch, 1863:659 (biology); Fitch, 1865:177 (habits, control); Fuller, 1869:114 (habits, damage, parasite); Walsh and Riley, 1869a:114 (habits, damage); Crotch, 1873b:94 (N. Amer. checklist); Crotch, 1873a:26 (taxonomy); Schmelter, 1878:55 (distribution); Comstock, 1880:216 (life history); Fuller, 1880:3 (habits, control); Lintner, 1882:239 (description, control); Smith, 1884:182 (control); Henshaw, 1885:105 (N. Amer. checklist); Smith, 1890:241 (distribution); Schwarz, 1890:58 (spread); Smith, 1892:207 (control); Hamilton, 1894:397 (spread); Howard, 1895:222 (introduction and spread); Wickham, 1896a:74 (general data); Webster, 1897:203 (distribution); Chittenden, 1897a:341 (history, distribution, biology, control); Chittenden, 1897b:34 (general data); Reinecke, 1897:13 (distribution); Chittenden, 1898:54 (habits, enemies); Lugg, 1899a:135 (distribution); Lugg, 1899b:220 (habits); Felt, 1900:26 (distribution); Smith, 1900:299 (adult, larva, description); Pic, 1900:65 (color varieties); Klages, 1901:273 (distribution); Ulke, 1902:27 (distribution); Dury, 1906a:253 (distribution); Dury, 1906b:259 (distribution); Pic, 1906:119 (color varieties and key); Surface, 1906:6 (all stages described); Müller, 1907:11 (varieties); Chittenden, 1907:6 (spread, habits, remedy); Chittenden, 1908:2 (history, habits, remedy); Paxson, 1908:326 (distribution); Lutz, 1908:50 (inheritance of variations); Easton, 1909:53 (distribution); Fernald, 1909:278 (an egg parasite); Crawford, 1909:150 (an egg parasite); Blatchley, 1910:1112 (taxonomy); Smith, 1910:338 (distribution); Sharp and Muir, 1912:561 (male genitalia); Clavareau, 1913:41 (world

catalog); Johnson, 1915:316 (distribution); Chagnon, 1917:239 (distribution); Chittenden, 1917:3 (general data); Leng, 1920:287 (N. Amer. checklist); Britton, 1920:273 (distribution); Chittenden, 1922:97 (recent spread); Stickney, 1923:14 (head-capsule morphology); Leng and Davis, 1924:65 (distribution); Hatch, 1927:211 (color varieties); Brisley, 1928:116 (description); Leonard, 1928:461 (collection data); Crowell, 1929:101 (habits); Davidson, 1931:396 (alimentary canal); Beller and Hatch, 1932:73 (color varieties); Hatch and Beller, 1932:103 (color variety); Dingler, 1932:705 (morphology and stridulation); Bunnett, 1936–37:113 (egg, larva, pupa, adult); Chagnon, 1937:227 (illustrations); Brimley, 1938:221 (distribution); Hatch, 1938:188 (bibliography); Powell, 1941:154 (male genitalia); Sailsbury, 1943a:61 (larval morphology); Sailsbury, 1943b:133 (larval key); Hughes, 1944:130 (distribution); Verdcourt, 1946a:123 (color variation); Verdcourt, 1946b:135 (color and length variation); Verdcourt, 1946c:145 (genitalia, wings, elytra); Verdcourt, 1947:79 (activity); Fattig, 1948:5 (distribution); Knowlton, 1951:56 (distribution); Wilcox, 1954:376 (taxonomy); Peterson, 1957:76 (larval morphology); Monros, 1960:177 (world checklist); Hatch, 1971:165 (taxonomy); Wilcox, 1974a:6 (N. Amer. checklist); Wilcox, 1974b:6 (Amer. checklist); Taylor and Harcourt, 1975:22 (distributional pattern); Petitpierre, 1980:180 (chromosomes).

Crioceris cruciata Schuster, 1905:213; Monros, 1960:177 (world catalog).
Crioceris normalis Schuster, 1905:213; Monros, 1960:178 (world catalog).
Crioceris trifasciata Schuster, 1905:213; Monros, 1960:178 (world catalog).
Crioceris pici Heyden, 1906:125; Monros, 1960:178 (world catalog).
Crioceris impupillata Heyden, 1906:125; Monros, 1960:177 (world catalog).
Crioceris schusteri Heyden, 1906:125; Monros, 1960:178 (world catalog).
Crioceris sexsignata Heyden, 1906:125; Monros, 1960:178 (world catalog).

Diagnosis

Tarsal claws not touching basally; prothoracic sides arcuate; elytra patterned with sutural area broadly dark.

Description

General. Head, antennae, ventral surface, most of legs, and elytral pattern black, most black areas with a bluish reflection. Following parts usually orange: Tips of mouthparts, pronotum, sides and apex of elytra, bases of femora and tibiae, a spot on each side of 5th abdominal segment. Discal region of each elytron from base to just before apex yellow to orange yellow, interrupted by black.

Color Variation. See figure 5. Pronotal disk often with 2 elongated black spots that may meet posteriorly; black on elytra may extend broadly along suture and meet with black on humerus; sutural stripe usually with median and apical lateral extensions; orange at base of femora may be much reduced to nearly absent.

Head. An antenna a little less than 1/2 as long as body, outer segments broad, each segment from 7 to 10 a little longer than wide, segment II clearly longer than wide. Front with a deep longitudinal groove; front and vertex with fine and coarse punctation, moderately dense; clypeal region with fine and coarse punctation, moderately dense.

Pronotum. Prothoracic length and width subequal, width greatest medially; no constriction; surface throughout with very fine and coarse punctation, moderate in density.

Elytra. With or without a weak depression at basal 1/4; large punctures of striae strong basally and along suture, weakest apically on disk, weak to obsolete on remainder of elytra; surface with weak development of fine punctation and fine, irregular, usually transverse grooves.

Ventral Surface. Metasternum with coarse, setiferous punctures on each side, densest anteriorly; medially often with transverse grooves; sternites 1–4 with medial series of setiferous, moderate-sized punctures; sides and sternite 5 with much denser setiferous punctation.

Length. Body 4.7–6.6 mm.

Aedeagus. In lateral view (fig. 87) broad, apical tip directed forward, upper apical margin nearly straight and meeting lower margin at a wide angle; in dorsal view sides subparallel, apex very blunt, tiny orifice overlaid by 3 tiny lobes, median lobe arcuate, portion behind orifice much reduced and concave; internal processes simple, in dorsal view symmetrical.

Type Material

Various ones of the Linnaean specimens have been deposited in the Museum at Uppsala, in the Linnaean Society of London, and in Drotningholm. The location of the type of this species is not known. Because this is such a familiar and well-known species, there can be little doubt as to the correct association of the name. In the original description there appears, "Habitat in Asparago officinali." There are no other collection data.

Material Examined

I examined 1,018 specimens. They were collected in the following locations. **Alabama**—Auburn; Lee Co. **Arkansas**—Washington Co.; Mississippi Co. **California**—Clarksburg; Sonoma Co., 3.5 mi. NW Petaluma; Santa Barbara; San Jose; East Palo Alto; Palo Alto; Antioch; Oakley; Hayward, Alameda Co.; San Mateo Co.; Santa Ana. **Connecticut**—Milford; New Haven. **Delaware**—Rehoboth; Georgetown. **District of Columbia**. **Idaho**—Kuna. **Illinois**—Willow Springs. **Indiana**—Richmond. **Iowa**—Iowa City; Ames; Clermont. **Maryland**—Prince Georges Co.; Berlin; Laurel; Branchville; Bladensburg; Chevy Chase; South Mt., Dorchester Co.; Baltimore. **Massachusetts**—Chicopee; Melrose; W. Springfield; Concord; Middlesex Co.; Stoneham; Milton; Natick; Northampton; S. Springfield; Beach Bluff. **Michigan**—Grand Rapids; Washtenaw Co.; Detroit. **Minnesota**—Lake City; Minneapolis. **Missouri**—Webster Groves. **New Jersey**—Camden; Clifton; Billingsport; Malaga; Glassboro; Westville; Boonton; Wenonah; Riverton; Oradell; Cumberland Co.; Emerson. **North Carolina**—Raleigh. **Ohio**—Dayton; Sandusky; Columbus; Crawford Co.; Morrow Co. **Oregon**—Salem; Biggs; Woodburn; Colton. **Pennsylvania**—Roxborough; Philadelphia; Edge Hill; Wyndmoore; Glen Olden; Easton; North East; Westchester. **Rhode Island**—Newport; Providence. **Texas**—no locality given. **Utah**—Plain City; W. Ogden. **Virginia**—Falls Church; Coles Point; Enola; Warrenton; Glencarlyn; Vienna; Ft. Monroe; Fredericksburg. **Washington**—Walla Walla; Blaine; Mt. Vernon; Yakima; Kennewick. **Wisconsin**—Madison;

Kennewick. **West Virginia**—Fairmont; Wood Co. **Canada. British Columbia**—New Westminster; Vancouver. **Ontario**—Hamilton; Fort Erie; Toronto; Blenheim; Chatham; Coldstream; St. Lawrence Isl. **Quebec**—Hull.

Distribution

Crioceris asparagi occurs nearly throughout the northern half of the United States, but its occurrence also extends southward into mid-Alabama and into southern California (fig. 71).

Hosts

Both larvae and adults of *C. asparagi*, the asparagus beetle, feed exclusively on asparagus leaves. This beetle is the worst pest of asparagus.

Remarks

The references listed above emphasize American publications. The list excludes nearly all but taxonomic, morphological, distributional, and biological references. The "Index to American Economic Entomology" (Entomological Society of America 1905–1957) lists about 235 references for this species; these are primarily economic papers, and few are included here.

The extent of color variation is much greater in this species than in any of the other 43 species of Criocerinae in North America. Nevertheless, the species is readily recognized and not easily confused with any of the other species of the Criocerinae.

The pronotum is usually orange but varies from light orange (especially at anterior and posterior margins) through red orange. Dark markings on the pronotum are often absent but, when present, vary from a small spot on each side of the disk to a joined, large discal spot. The percentage of specimens which bear dark pronotal markings seems to be slightly greater than the percentage of specimens without such markings. In other species of Criocerinae the dark markings of the pronotum and elytra vary in extent in the same direction; that is, the greatest or least extent of dark markings on elytra and pronotum typically occur in one individual. Such is not the case with the pronotal and elytral dark markings of *C. asparagi*, for these body parts vary independently as regards these markings. For the preceding reasons, I have shown (fig. 5) the least and greatest development of dark markings on the pronotum separate from the drawings showing the elytral color variation.

Numerous names have been proposed for color variants of this species. These names are not included in the synonymy above, for there is no good reason to perpetuate their use.

***Crioceris*
duodecimpunctata
(Linnaeus)**
(figs. 4, 47, 70, 88)

Chrysomela duodecimpunctata Linnaeus, 1758:376.

Lema duodecimpunctata (Linnaeus), Dejean, 1821:115 (world checklist); Suffrian, 1841b:42 (taxonomy).

Crioceris duodecimpunctata (Linnaeus), Lacordaire, 1845:581 (taxonomy); Suffrian, 1846:156 (taxonomy); Emmons, 1854:17 (distribution, description, notes); Lintner, 1882:244 (distribution); Henshaw, 1885:105 (N. Amer. checklist); Lugger, 1890:59 (distribution); Smith, 1892:207 (distribution); Hamilton, 1894:486 (notes on spread); Wickham, 1896a:74 (distribution);

Wenzel, 1896:281 (distribution); Chittenden, 1897:350 (history, distribution, habits, control); Smith, 1897:350 (distribution); Chittenden, 1898:57 (habits, life cycle); Joutel, 1900:207 (distribution); Smith, 1900:299 (adult, larva illustrated, described); Felt, 1900:188 (distribution, notes, treatment); Ulke, 1902:27 (distribution); Britton, 1903:188 (distribution); Chittenden, 1907:9 (spread, larva); Chittenden, 1908:9 (spread, habits, life history, remedy); Smith, 1910:338 (distribution); Clavareau, 1913:45 (world catalog); Johnson, 1915:316 (distribution); Davis 1916:242 (distribution); Chittenden, 1917:11 (general data and control); Chagnon, 1917:239 (distribution); Leng, 1920:287 (N. Amer. checklist); Britton, 1920:273 (distribution); Leng, 1924:65 (distribution); Hatch, 1924b:308 (distribution); Brisley, 1928:116 (not in Western United States); Leonard, 1928:461 (collection data); Harris, 1931:1311 (in Iowa); Schaeffer, 1933:299 (color variety); Blackwelder, 1939:60 (N. Amer. checklist); Wright and Whitehouse, 1941:172 (distribution); Sailsbury, 1943a:66 (larval morphology); Sailsbury, 1943b:133 (in larval key); Hughes, 1944:130 (distribution); Knowlton, 1951:56 (in Utah); Wilcox, 1954:376 (taxonomy); Peterson, 1957:76 (larval morphology); Monros, 1960:175 (world checklist); Hatch, 1971:165 (taxonomy); Wilcox, 1974a:6 (N. Amer. checklist); Wilcox, 1974b:7 (Amer. checklist); Van Alphen and Boer, 1980:136 (larval habits); Petitpierre, 1980:180 (chromosomes).

Crioceris abeillei Pic, 1894:284; Pic, 1898:155 (taxonomy); Monros, 1960:175 (world catalog).

Diagnosis

Tarsal claws not touching basally (fig. 47); prothoracic sides arcuate; elytra orange with 12 (rarely 10) black spots.

Description

General. Body predominantly orange to red orange; of orange parts, elytra and abdomen (to a lesser extent) lighter than remainder. Following parts black: Labrum, area immediately adjacent to eyes, antennae, eyes, scutellum, 6 spots on each elytron, most to part of sterna, coxae in part, trochanters, femoral apices, tibial bases and apices, and tarsi. Surfaces shiny to moderately shiny.

Color Variation. In very light specimens most parts normally black may be brown, and sternal parts mostly orange; scutellum may be partly to all orange; of 6 spots on each elytron (numbered from front to back), spots 4 and 6 usually largest, spots 2, 3, and 5 smallest, spot 5 most variable in size.

Head. An antenna a little less than 1/2 as long as body; outer segments broad, each of segments 7–10 about as long as wide, segment 11 longer than wide. Front with a median, longitudinal groove and with punctation variable in size, moderate in density; clypeus with moderate-sized punctation, moderate in density.

Pronotum. Width greatest apically and a little greater than length; constriction weak, at about basal 1/4, width at constriction about 90%–93% of apical width; at basal 1/4 a weak transverse depression; surface anteriorly with moderate-sized punctures located medially and apically on each side; surface also throughout with fine punctation, moderate in density, variable in size.

Elytra. Each elytron with a depression at or just below basal 1/4 and centered on 3d interval, depression with black pigment; surface with weak tendency to transverse grooves and fine punctation. Striae distinct throughout, but punctures small, denser apically, and more or less confused at apex.

Ventral Surface. Metasternum with moderate-sized setiferous punctation, most dense anteriorly each side. Abdomen with medially located setiferous punctation, moderate sized, moderate in density; punctation dense on each side.

Length. Body 4.9–6.6 mm.

Aedeagus. In lateral view (fig. 88) widest medially, apical tip directed forward and sharply pointed, upper apical margin weakly convex; in dorsal view sides subparallel, apex quite blunt, small orifice overlaid by 3 lobes, lateral lobes concealing median lobe and weakly convex behind orifice; internal processes complex, in dorsal view symmetrical and vaguely of a human form.

Type Material

Various ones of the Linnaean specimens have been deposited in the Museum at Uppsala, in the Linnaean Society of London, and in Drottningholm. The location of the type of this species is not known. This is a familiar and well-known species, and there can be little doubt that the name is correctly assigned. In the original description, the collection data state, "Habitat in Europa."

Material Examined

I examined 442 specimens. The locations in which the specimens were collected follow. **Colorado**—Douglas Co.; Boulder. **Connecticut**—New Haven. **Delaware**—Rehoboth. **District of Columbia**. **Idaho**—Moscow. **Illinois**—Godfrey; Chicago. **Indiana**—Richmond. **Iowa**—Ames; Iowa City. **Maine**—Elliot; Orono; Topsham. **Maryland**—Great Falls; Baltimore; College Park; Maugansville. **Massachusetts**—W. Springfield; Amherst; Arlington, Melrose; Steughton; S. Duxbury; Milton; Middlesex; Northampton; Beach Bluff; Stoneham; Concord; Natick. **Michigan**—Washtenaw Co.; Monroe; Agricultural College. **Minnesota**—Lake City; Pipe Co.; Minneapolis. **New York**—Ithaca; Buffalo, Rock B.; Brooklyn, West Point; Quaker Bridge; N.Y. City; Yaphank, Long Isl.; Halfway Hollow Hill, L. Isl.; Niagara Falls; Warren; Newark; Seneca Co. **New Jersey**—Riverton; Clifton; Wenonah; Glassboro; Cramer Hill; Gloucester Co.; Oradell; Cumberland Co.; Westville; Bound Brook; Emerson. **Ohio**—Jefferson; Sandusky; Columbus; Amherst; Portage Co.; Clinton Co. **Oregon**—Boardman; Freewater. **Pennsylvania**—Roxborough; Edge Hill; Chester Co.; Glen Olden; Philadelphia; Bushkill; Easton; North East. **Rhode Island**—Wakefield. **Vermont**—Burlington. **Virginia**—Vienna; Falls Church; Colonial Beach. **Washington**—Walla Walla. **Wisconsin**—Madison; Clintonville; Milwaukee; Waukosha Co.; Albany.

Distribution

Crioceris duodecimpunctata is found through most of the northern half of the United States, most frequently in Northeastern United States, and into Canada (fig. 70).

Hosts

Crioceris duodecimpunctata, the spotted asparagus beetle, is found exclusively on asparagus; the larvae feed in berries.

Remarks

The literature references above emphasize American publications. Excluded are nearly all but papers on taxonomy, morphology, distribution, and biology. The "Index to American Economic Entomology" (Entomological Society of America 1905-1957) lists about 95 papers for this species. Few in the list are included here.

As compared with the members of *C. asparagi*, those of *C. duodecimpunctata* differ very slightly in the dark markings of the dorsum. Very few specimens of *C. duodecimpunctata* show loss of a dark spot (fig. 4a), and only 1 of the well over 400 specimens examined shows enlargement of the spots, as pictured in figure 4b.

Most specimens have elytra that are noticeably to clearly lighter than the head and pronotum. The last two body parts are generally more or less red orange whereas the elytra are light to medium orange, or red orange.

***Lilioceris* Reitter**

Lilioceris Reitter, 1912:79; Heinze, 1927a:163; Heinze, 1931:53; Chujo, 1951:80; Monros, 1960:168; Gressitt and Kimoto, 1961:42; Arnett, 1968:905; Wilcox, 1974a:11; Wilcox, 1974b:14; Seeno and Wilcox, 1982:27. Type species, *Lilioceris merdigera* (F.), designated by Heinze (1937). *Bradycerus* Chujo, 1951:82 (subgenus). Type species, *Crioceris lewisi* Jacoby. *Chujoita* Monros, 1960:140 (subgenus). Type species, *Crioceris camelus* Duvivier.

Description**General**

Length 6.3–7.3 mm; pronotum and elytra yellow to orange yellow; head, ventral surface, and appendages black to dark brown.

Head

An antenna just over 1/2 length of body, slightly expanded apically. Vertex somewhat produced and with a median, longitudinal groove, frontal grooves forming an X. Eyes deeply, acutely notched; head strongly constricted behind eyes.

Pronotum

Width about equal to length, slightly more than 1/2 width of elytra at humeri; constriction quite deep and located medially; surface mostly smooth and shiny; large punctures located medially in a longitudinal band and anteriorly on each side.

Elytra

Width about 2/3 of length. Ten more or less easily discernable striae; punctures of striae not close, moderate in size near base, much smaller near apex; sutural stria irregular in development and length.

Ventral Surface

Tarsal claws divergent, separated basally.

***Lilioceris lili* (Scopoli)** (figs. 2, 46, 50, 70, 86)

Attelabus lili Scopoli, 1763:36 (in error Scopoli attributed name to Linnaeus).
Crioceris merdigera Fabricius, 1775:120; Sanderson, 1900:257 (discussion, illustrations).
Lema merdigera (Fab.), Suffrian, 1841a:24 (general data); Suffrian, 1841b:38 (general data).
Crioceris liliorum Thomson, 1866:138.
Crioceris lili (Scop.); Weise, 1889:418 (genitalia); Schröder, 1897:516 (biology); Clavareau, 1913:47 (world catalog); Barton, 1940:236 (biology); Barton, 1941:278 (biology); Barton, 1943:18 (biology); Donisthorpe, 1943:120 (biology); Fox-Wilson, 1942:165 (biology); Fox-Wilson, 1943:85 (hosts, distribution).
Lilioceris lili (Scop.), Tèmpere, 1926:131 (taxonomy); Seamans, 1945:214 (in Quebec); Palmquist, 1945:116 (biology); Twinn, 1946a:55 (distribution); Twinn, 1946b:8 (distribution); Brown, 1946:47 (distribution, habits); Gauthier, 1946:32 (distribution); Dustan, 1946:103 (distribution); Maltais, 1946:35 (distribution); MacNay, 1947:363 (distribution); Gauthier, 1947:108 (distribution); Gauthier, 1948:96 (distribution); Blackwelder and Blackwelder, 1948:42 (N. Amer. checklist); Canadian Insect Pest Review, 1948:342 (distribution); Gauthier, 1949:96 (distribution); Gauthier and Doyle, 1950:75 (distribution); Gauthier and Doyle, 1951:78 (distribution); Gauthier and Doyle, 1952:83 (distribution); MacNay, 1953:282 (distribution); Smith and Doucette, 1953:21 (distribution, habits); Monros, 1960:168 (world checklist); Arnett, 1968:921 (distribution); Fjelddalen, 1963:140 (biology); Wilcox, 1974a:6 (N. Amer. checklist); Wilcox, 1974b:7 (Amer. checklist); Berti and Rapilly, 1976:35 (morphology); Wilcox, 1979:10 (hosts); Furieri, 1977:113 (sperm study); Petitpierre, 1980:182 (chromosomes); LeSage, 1983:95 (distribution, present and future).
Lema melanocephala Say, 1827:294; Lacordaire, 1845:422 (taxonomy); Clark, 1866:31 (world catalog); Crotch, 1873a:26 (taxonomy); Gemminger and Harold, 1874:3257 (world catalog); Provancher, 1877:648 (distribution); Austin, 1880:35 (N. Amer. checklist); Henshaw, 1885:105 (N. Amer. checklist); Scudder, 1899:412 (taxonomy); Jacoby and Clavareau, 1904:15 (world catalog); Clavareau, 1913:83 (world catalog); Schaeffer, 1933:304 (taxonomy); Blackwelder, 1939:61 (N. Amer. checklist); Brown, 1946:47 (taxonomy); Monros, 1960:168 (world checklist); Wilcox, 1974a:6 (N. Amer. checklist); Wilcox, 1974b:7 (Amer. checklist).

Diagnosis

Tarsal claws not touching basally (fig 46); elytra entirely yellow; sides of prothorax strongly constricted.

Description

General. Pronotum and elytra yellow orange to orange to dull orange red, remainder of body and appendages black. Surfaces shiny.

Color Variation. Sometimes tibial apices and tarsi very dark brown.

Head. An antenna just over 1/2 as long as body; outer segments elongated, segments 7–10 each less than 2 times as long as wide, segment 11 about 2 times as long as wide. Vertex with a deep longitudinal groove; surface of each side of groove somewhat inflated and with sparse, moderate-sized punctures (fig. 50). Clypeal region with moderate to large punctures, moderate in density.

Pronotum. Widest anteriorly, width and length subequal; a strong median constriction, width at constriction about 75%–85% of apical width; from anterior margin to near base, large punctures in longitudinal series, also present each side anteriorly; surface also with minute, sparse punctures; a weak, arcuate, transverse depression at about basal 1/4.

Elytra. Punctuation of striae distinct throughout, may be irregular near base, smaller and denser near apex; vague depression sometimes present at basal 1/4; surface smooth, with little to no evidence of fine punctuation or grooves.

Ventral Surface. Metasternum with generally sparse, moderate-sized setiferous punctures, most dense anteriorly on each side; each abdominal sternite with series of moderate-sized punctures before posterior margin and with fine punctures, all punctures densest at sides.

Length. Body 6.3–7.3 mm.

Aedeagus. In dorsal view (fig. 86) widest medially, widest point behind anterior declivity, apical tip directed forward and sharply pointed, upper apical margin sinuate; in dorsal view sides subparallel, margins behind apical tip sinuate, small orifice overlaid by 3 lobes, median lobe weakly arcuate, portion behind orifice flat; internal processes complex, extensive, in dorsal view symmetrical, broad.

Type Material

The Scopoli collection was evidently destroyed by fire in 1766. In the original description no locality of collection was given. I select as neotype of *L. lili* a specimen (USNM) with the data “S. France, HL Parker; HL Parker colln.”

Distribution

L. lili occurs in Quebec (Outremont and Montreal) and Ontario (Ottawa), Canada (fig. 70). I examined only eight North American specimens.

Hosts

This species feeds on *Lilium regale* and *L. tigrinum* (Barton 1940:236).

Remarks

Seamans (1945:214) first reported *L. lili* as established in North America at Outremont, Quebec. Le Sage (1983:95) believes that it will spread from its current distribution in southern Canada. This beetle is a pest of some significance in Europe and with further spread into Northeastern United States could become a pest there also.

The literature references above are intended to include all North American references but only selected references from European and world literature.

I agree with Brown (1946:47) that Say's *L. melanocephala* is almost certainly identical with *L. lili*. Unfortunately, no specimens of Say's *melanocephala* are known. Say (1827:294) wrote that his specimens were from the Northwest Territory and received from T.W. Harris of Massachusetts. Scudder (1899:412) in a paper on manuscript notes by T.W. Harris on Say's insects wrote, "P. 340. *Lema melanocephala*. *L. merdigera* F. The specimen sent by T.W.H. was undoubtedly identical with the European species. It was given with other insects by Mrs. Peck and probably was brought from Europe by the late Prof. Peck."

There is but slight color variation among the few examples of *L. lili* I examined. In most specimens the head, ventral surface, and appendages are black. In a single specimen the legs and ventral surface are dark brown.

A Forgotten Name

***Lema ornata* Gravenhorst**

Lema ornata Gravenhorst, 1807:138; Gemminger and Harold, 1874:3258; Clavareau, 1913:83; Leng, 1920:287; Leng, 1927:44; Monros, 1960:222.

Original Description

The following is from Gravenhorst (1807): “. . . 79. *L. ornata* (n. sp.) so lang wie *L. merdigera*, aber schmaler; Halsschild an den Seiten tief eingebogen. Kopf gelblichroth; Augen und Fühlhorner schwarzbraun, letztere mit gelbrothem Wurzelgliede. Halsschild gelblichroth mit zwei schwarzen Punkten etwas über der Mitte. Flügeldecken punktirt gestreist, hellgelbbraun mit breiter schwerer Naht und einer breiten Langlinie, die dicht vor der Schulter anfängt und die Spitze nicht ganz erreicht. Hinterleib und Füße gelbroth mit schwarzbraunen Schienbeinen und Fussblättern.”

The photocopy that I have of the original description of this species does not give the locality of collection. Clavareau (1913:83) gave the locality of this species as North America. The original description makes it clear that the species described is certainly a member of *Lema* and that the species is very similar to the North American *L. trilinea* and *L. trivittata medionota*. If Gravenhorst was indeed describing a North American beetle, then I feel reasonably confident that the beetle was either *L. trilinea* or *L. trivittata medionota*. Especially convincing is the reference to the black-brown tibiae and tarsi. This coloration describes well that of the legs of both *trilinea* and *t. medionota*. I believe it unlikely that the taxon described was *L. trivittata trivittata*, a subspecies that typically has dark tarsi but only partly dark tibiae. The subspecies *L. t. medionota* has more black on the legs than is typical for *L. t. trivittata*. If Gravenhorst's description does apply to *L. trilinea*, then his name is older than any now available for the species. I regard Gravenhorst's name as a forgotten name, and because of this and the uncertainty of the site of collection, I believe there can be no justification in using the name *ornata* for *trilinea* or for *t. medionota*. The third edition of the “International Code of Zoological Nomenclature” (International Commission on Zoological Nomenclature 1985), unlike the second edition, makes no provision for forgotten names, so I am following the spirit of the earlier codes.

Gemminger and Harold (1874:3258) listed *ornata* Gravenhorst as a synonym of *Lema trivittata* Say. I do not accept the synonymy for the reasons given above.

H.S. Barber found reason to believe that *L. ornata* Grav. is the same as *L. trivittata medionota* Schaeffer, for there is a specimen of the latter from Walton, Florida, determined by Barber in 1944 as *L. ornata*. I have examined his accumulated notes (unpublished) on *Lema* and can find no written basis for his identification.

Uncertain Status

***Lema intermedia* (Guérin)** *Crioceris intermedia* Guérin, (1844:261).
Lema intermedia (Guér.), Clavareau, 1913:79; Monros, 1960:207.

Following is the description of *C. intermedia* by Guérin (1844): “Intérmediaire entre les *Lema immaculicollis* Chevr. (Col. du Mex., 5e fasc., no. 112), et sa poitrine noires et ses pattes et tarses entierement jaunes, et du second par son corselet sans tache, par la suture, dont le noir descend jusqu’au bord postérieur des elytres, etc. Cet insecta à la tête noire, luisante, avec les trois premiers articles des antennes (les autres sont casses) jaunes. Le corselet est lisse, d’un p. 262-jaune fauve, fortment excave de chaque côte, avec le fond de l’excavation de troite noir. L’écusson est noir. Les elytres sont noires, avec des stries de gros points enfonces et deux lignes jaunes, l’une marginale et l’autre en dessus, assez près de la suture, atteignant l’extrémité de l’elytre ou elle se joint la ligne extérieure. Le noir de la suture arrive jusque l’extrémité de l’elytre. Le dessous est jaune l’exception du mésothorax et du metathorax que sont noirs. Les pattes sont entierement jaunes. sans taches.—Long. 7, 1. 3 1/2 mill.—Hab. la Nouvelle-Orleans.”

Crioceris intermedia Guérin is listed in catalogs as a synonym of *Lema signaticornis* Chev. (Clavareau 1913:79, Blackwelder 1946:631, Monros 1960:207). The French description of *C. intermedia* (which I have translated) agrees well with USNM specimens (from Mexico) identified as *L. signaticornis*. If the species now known as *L. signaticornis* actually occurs in the area of New Orleans, it could reasonably be expected to have been collected from there and recognized since 1844, when the description of *C. intermedia* was published. However, *L. signaticornis* agrees with no specimens that I have seen from the United States, and I find no indication in the literature that the species has been recognized in this country since 1844. So I consider that the locality given by Guérin for *C. intermedia* is most likely erroneous.

References Cited

- Ahrens, A. 1812. Beiträge zur Kenntniss deutscher Käfer. Neue Sch. Nat. Ges. Halle. 2:1–40.
- Andrews, A.W. 1923. The Coleoptera of the Shiras expedition to Whitefish Point, Chippewa County, Michigan. Pap. Mich. Acad. Sci., Arts Lett. 1:293–390.
- Arnett, R.H. 1968. The beetles of the United States (A manual for identification). Amer. Entomol. Inst., Ann Arbor, MI. pp. 1–1112.
- Austin, E.P. 1880. Supplement to the check list of the Coleoptera of America, north of Mexico. S.E. Cassino, Boston. 67 pp.
- Baker, C.F. 1895. Biological notes on some Colorado Coleoptera. Entomol. News 6:27–29.
- Balsbaugh, E.U., Jr., and K.L. Hays. 1972. The leaf beetles of Alabama (Coleoptera: Chrysomelidae). Auburn Univ. Agric. Exp. Stn. Bull. 441, 223 pp.
- Baly, J.S. 1865. Descriptions of new species of Crioceridae. Ann. Mag. Nat. Hist., Ser. 3, No. 16, pp. 153–160.
- Baly, J.S. 1873. IV. Catalogue of the phytophagous Coleoptera of Japan, with description of the species new to science. Trans. Entomol. Soc. Lond. pp. 69–99.
- Barton, L.F. 1940. *Crioceris lili* Scop. (Col., Chrysomelidae), in Chobham, Surrey. Entomol. Mon. Mag. 77:236.
- Barton, L.F. 1941 Notes on *Crioceris lili* Scop. (Col., Chrysomelidae). Entomol. Mon. Mag., 4th Ser., 77:278.
- Barton, L.F. 1943. Notes on *Crioceris lili* Scop. (Col. Chrysomelidae). Entomol. Mon. Mag. 4th Ser., 79:18–19.
- Bates, H.W., and H. Clark. 1866. Descriptions of new species of Phytophaga. In H. Clark, A Catalogue of Phytophaga (Coleoptera, Pseudotetramera). London. 88 pp.
- Batra, S.W.T., J.R. Coulson, P.H. Dunn, and P.E. Boldt. 1981. Insects and fungi associated with *Carduus* thistles (Compositae). U.S. Dep. Agric. Tech. Bull. 1616, 100 pp.
- Battenfield, S., S. Wellso, and D. Haynes. 1982. Bibliography of the cereal leaf beetle. Bull. Entomol. Soc. Amer. 28:291–301.
- Bedel, L.E.M. 1889–98. Faune des Coléoptères du bassin de la Seine. Ann. Soc. Entomol. Fr. vol. hors ser. 5:1–228.
- Belkin, J.N. 1933. Additions to the New York State list of insects. Bull. Brook. Entomol. Soc. 28:220–222.

- Beller, S., and M.H. Hatch. 1932. Coleoptera of Washington: Chrysomelidae. Univ. Wash. Pub. Biol. 1:65–144.
- Berti, N. 1989. Contribution à la faune de France. L'identité d'*Oulema* (*O.*) *melanopus* (L.) (Col. Chrysomelidae Criocerinae). Bull. Soc. Entomol. Fr. 94:47–57.
- Berti, N., and M. Rapilly. 1976. Faune d'Iran, liste d'espèces et revision du genre *Lilioceris* Reitter (Col. Chrysomelidae). Ann. Soc. Entomol. Fr. N.S. 12:31–73.
- Bethune, C.J.S. 1909. Insects affecting vegetables. Ont. Dep. Agric. Bull. 171:32–33.
- Bianchi, F.A. 1954. *Lema californica* Schaeffer. Proc. Hawaii Entomol. Soc. 15:266.
- Blake, D.H. 1952. American Chrysomelidae in the Bosc collection. Proc. Entomol. Soc. Wash. 54:57–68.
- Blackwelder, R.E. 1939. Fourth supplement to the Leng catalogue of Coleoptera of America, north of Mexico. J.D. Sherman, Mount Vernon, NY. 146 pp.
- Blackwelder, R.E. 1946. Checklist of the coleopterous insects of Mexico, Central America, the West Indies, and South America. Smithson. Inst. Bull. 185, pt. 4, pp. 551–763.
- Blackwelder, R.E., and R.M. Blackwelder. 1948. Fifth supplement 1939 to 1947 (inclusive) to the Leng catalogue of Coleoptera of America north of Mexico. J.D. Sherman, Mount Vernon, NY. 87 pp.
- Blatchley, W.S. 1910. An illustrated descriptive catalogue of the Coleoptera or beetles known to occur in Indiana. Nature Pub. Co., Indianapolis. 1386 pp.
- Blatchley, W.S. 1913. On some apparently new Coleoptera from Indiana and Florida. Can. Entomol. 45:21–24.
- Blatchley, W.S. 1914. Notes on the winter and early spring Coleoptera of Florida, with descriptions of new species. Can. Entomol. 46:88–92.
- Blatchley, W.S. 1924. The Chrysomelidae of Florida. Fl. Entomol. 7:33–39.
- Blatchley, W.S. 1928. Notes on some Florida Coleoptera with descriptions of new species. Can. Entomol. 60:60–73.
- Böving, A.G., and F.C. Craighead. 1931. An illustrated synopsis of the principal larval forms in the order Coleoptera. Brook. Entomol. Soc. N.Y. 351 pp.
- Brimley, C.S. 1938. The insects of North Carolina. N.C. Dep. Agric., Raleigh. 560 pp.

- Brisley, H.R. 1925. Notes on the Chrysomelidae (Coleoptera) of Arizona. Trans. Amer. Entomol. Soc. 51:167–182.
- Brisley, C.S. 1928. A short review of the tribes Orsodacnini and Criocerini of the coleopterous family Chrysomelidae with special reference to species of Western United States. Pan-Pac. Entomol. 4:114–119.
- Britton, W.E. 1903. Twelve-spotted asparagus beetle in Connecticut. Can. Entomol. 35:188.
- Britton, W.E. 1920. Check-list of the insects of Connecticut. Conn. State Geol. Nat. Hist. Surv. Bull. 31, 395 pp.
- Brown, W.J. 1938. Some new Canadian Chrysomelidae. Can. Entomol. 70:35–38.
- Brown, W.J. 1946. Some new Chrysomelidae with notes on other species. Can. Entomol. 78:47–54.
- Bulletin of Zoological Nomenclature. 1970. Opinion 908. *Crioceris* Müller, 1764, and *Lema* Fabricius, 1798 (insects, Coleoptera): designation of type-species under the plenary powers. Bull. Zool. Nomencl. 27:12–13.
- Bunnett, E.J. 1936–37. Notes on the occurrence of *Crioceris asparagi* L. in the gardens at Elstead Lodge, near Godalming, in July, 1936. S. London Entomol. and N.H. Soc., Proc. Trans. p. 113.
- Canadian Insect Pest Review. 1948. Lily leaf beetle. Can. Ins. Pest Rev. 25:342.
- Carr, F.S. 1923. Additions to the list of the Coleoptera of northern Alberta. Can. Entomol. 60:196–197.
- Castle, D.M., and P. Laurant. 1896. April collecting in Georgia and Florida. Entomol. News 7:300–305.
- Castle, D.M., and P. Laurant. 1897. April collecting in Georgia and Florida. Entomol. News 8:7–9.
- Castro, T.R., R.F. Ruppel, and M.S. Gomulinski. 1965. Natural history of the cereal leaf beetle in Michigan. Quart. Bull. Mich. State Univ. 47:623–653.
- Chagnon, G. 1917. A preliminary list of the insects of the Province of Quebec. Pt. III—Coleoptera. Quebec Soc. Prot. Plants, Supp. pp. 161–277.
- Chagnon, G. 1937. Contribution a l'étude des Coléoptères de la Province de Quebec. Le Nat. Can. 64:218.
- Chen, S.H. 1940. Attempt at a new classification of the leaf beetles. Sinensia 11:451–481.
- Chagnon, G. 1985. Phylogeny and classification of the Chrysomeloidea. Entomography 3:465–475.

- Chevrolat, L.A.A. 1835. Coléoptères du Mexique. Strasbourg. Fasc. 5, pp. 101–28.
- Chevrolat, 1837, Dejean, P.F.M.A. 1937a. Catalogue des Coléoptères de la collection de M. le comte Dejean. Livr. 5, pp. 361–443. ("Second Edition").
- Chittenden, F.H. 1897a. The asparagus beetles. U.S. Dep. Agric. Agric. Yearb. 1896. pp. 341–352.
- Chittenden, F.H. 1897b. Insect enemies [of asparagus]. U.S. Dep. Agric. Farm. Bull. 61, pp. 34–39.
- Chittenden, F.H. 1898. Insects that affect asparagus. U.S. Dep. Agric. Bull. 10, N.S., pp. 54–62.
- Chittenden, F.H. 1907. Notes on the asparagus beetles. U.S. Dep. Agric. Bur. Entomol. Bull. 66. pt. 1, pp. 6–10.
- Chittenden, F.H. 1908. The asparagus beetles. U.S. Dep. Agric. Bur. Entomol. Circ. 102, pp. 1–12.
- Chittenden, F.H. 1917. The asparagus beetles and their control. U.S. Dep. Agric. Farm. Bull. 837, pp. 3–13.
- Chittenden, F.H. 1922. Recent spread of *Crioceris asparagi* L. Bull. Brook. Entomol. Soc. 17:97.
- Chittenden, F.H. 1924. *Lema trilineata* Oliv. (Coleop.) controlled by an egg parasite. Proc. Entomol. Soc. Wash. 26:46–48.
- Chujo, M. 1951. A taxonomic study on the Chrysomelidae (Insecta-Coleoptera) from Formosa (Part I—subfamily Criocerinae). Tech. Bull. Kagawa Agric. Coll. 2:71–120, 25 figs.
- Chujo, M. 1964. Family Chrysomelidae. In Kira, ed. Nature and Life in South-east Asia. 3:252–315.
- Clark, H. 1866. A catalogue of Phytophaga. (Coleoptera, Pseudotetramera). Part I. London. 50 pp.
- Clavareau, H. 1913. Coleopterorum Catalogus. Pars 51: Chrysomelidae: 1. Sagrinae, 2. Donaciinae, 3. Orsodacninae, 4. Criocerinae. A. Hopfer, Berlin. 103 pp.
- Clementi, V. 1872. Captures at North Douro, Co., of Peterboro, Ontario. Can. Entomol. 4:36–38.
- Cockerell, T.D.A. 1902. Records of the habits of New Mexican Coleoptera. Psyche. 9:378–381.
- Cockerell, T.D.A., and H.C. Fall. 1907. The Coleoptera of New Mexico. Trans. Amer. Entomol. Soc. 33:145–272.

- Comstock, J.H. 1880. The asparagus beetle. (*Crioceris asparagi* Linn., order Coleoptera; family Chrysomelidae). In Report of Commissioner of Agric. for 1879, pp. 216–218.
- Coquillett, D.W. 1883. Descriptions of a few leaf-eating coleopterous larvae. Can. Entomol. 15:21–23.
- Couper, W. 1883. Coleoptera found in the Province of Quebec. Can. Sports Nat. 3:219–220.
- Crawford, J.C. 1909. Two new species of the genus *Tetrastichus* (Hymenoptera, Eulophidae). Proc. Entomol. Soc. Wash. 11:150.
- Criddle, N., and R.H. Handford. 1933. *Lema trilineata* Oliv. in Manitoba (Coleoptera, Chrysomelidae). Can. Entomol. 65:150–151.
- Crotch, G.R. 1873a. Materials for the study of the Phytophaga of the United States. Proc. Acad. Nat. Sci. Philadelphia 25:19–83.
- Crotch, G.R. 1873b. Check list of the Coleoptera of America, north of Mexico. Naturalist's Agency, Salem, MA. 136 pp.
- Crowell, M.F. 1929. A note on the asparagus beetle, *Crioceris asparagi* Linn. Psyche 36:101.
- Curtis, J. 1830. British entomology; being illustrations and descriptions of the genera of insects found in Great Britain and Ireland: Containing coloured figures from nature of the most rare and beautiful species, and in many instances of the plants upon which they are found. 2: plate 323. London.
- Davidson, R.H. 1931. The alimentary canal of *Crioceris asparagi* Linn. Ohio J. Sci. 31:396–405.
- Davis, A.C. 1932. A list of the Coleoptera of Fort Tejon, California. Bull. South. Calif. Acad. Sci. 31:75–87.
- Davis, W.T. 1916. Louis H. Joutel. J. N.Y. Entomol. Soc. 24:239–243.
- Dejean, P.F.M.A. 1821. Catalogue de la collection de Coléoptères de M. le Baron Dejean Lieutenant-General des armées du Roi, commandeur de l'ordre royal de la legion d'honneur, chevalier de l'ordre royal et militaire de Saint-Louis. Didot, Paris. 136 pp.
- Dejean, P.F.M.A. 1835. Catalogue des Coléoptères de la collection de M. le Comte Dejean. Didot, Paris Livr. 4, pp. 257–360. ("Second Edition").
- Dejean, P.F.M.A. 1837a. Catalogue des Coléoptères de la collection de M. le Comte Dejean. Didot, Paris. Livr. 5, pp. 361–443. ("Second Edition").
- Dejean, P.F.M.A. 1837b. Catalogue des Coléoptères de la collection de M. le Comte Dejean, pair de France, lieutenant général, grand officier de la legion d'honneur, membre de plusieurs sociétés savantes nationale et étrangères. Didot, Paris. 503 pp. ("Third Edition").

- Des Gozis, M. 1886. Recherche de l'espèce typique de quelques anciens genres. Montluçon, pp. 5–36.
- Dickerson, E.L., and H.B. Weiss. 1920. The insects of the evening primroses in New Jersey. J. N.Y. Entomol. Soc. 28:32–74.
- Dingler, M. 1932. Das Stridulationsorgan von *Crioceris*. Biologish. Zentral. 52:705–709.
- Donckier de Donceel, H. 1885. Liste des Sagrides, Criocérides, Clytrides, Mégaloïdes, Cryptocéphalides et Lamprosomides, décrits postérieurement au catalogue de M.M. Gemminger et Von Harold. Mém. Soc. R. Sci. Liège, Ser. 2, 11:1–32.
- Donisthorpe, H. 1943. *Crioceris lili* Scop. (Col. Chrysomelidae) in Middlesex. Entomol. Mon. Mag., 4th Ser., 79:120.
- Douglass, J.R. 1929. Chrysomelidae of Kansas (1). J. Kans. Entomol. Soc. 2:2–15.
- Dozier, H.L. 1918. An annotated list of Gainesville, Florida, Coleoptera. Entomol. News 29:370–374.
- Dozier, H.L. 1920. An ecological study of hammock and piney woods insects in Florida. Ann. Entomol. Soc. Amer. 13:325–380.
- Dozier, H.L. 1922. An annotated list of Mississippi Chrysomelidae. Ohio J. Sci. 22:117–124.
- Dury, C. 1879. List of the Coleoptera observed in the vicinity of Cincinnati. J. Cincinnati Soc. Nat. Hist. pp. 1–17.
- Dury, C. 1902a. A revised list of the Coleoptera observed near Cincinnati, Ohio. J. Cincinnati Soc. Nat. Hist. 20:1–90.
- Dury, C. 1902b. A revised list of the Coleoptera observed near Cincinnati, Ohio. J. Cincinnati Soc. Nat. Hist. 20:107–196.
- Dury, C. 1906a. Ecological notes on some Coleoptera of the Cincinnati region including seven new species. J. Cincinnati Soc. Nat. Hist. 20:251–256.
- Dury, C. 1906b. Additions to the list of Cincinnati Coleoptera. J. Cincinnati Soc. Nat. Hist. 20:257–260.
- Dustan, A.G. 1946. A new insect on lilies in Canada. In Amer. Lily Yearbook, 1946. North Amer. Lily Soc., Washington, D.C., p. 103.
- Easton, N.S. 1909. A list of Coleoptera collected within ten miles of Fall River, Massachusetts. Psyche 16:49–57.
- Ehrhorn, E.M. 1936. *Lema nigrovittata* Guérin. Proc. Hawaii. Entomol. Soc. 9:140.

- Emmons, E. 1854. Natural history of New York. Vol. 5. Insects of New York. Albany. pp. 1-272, 47 plates.
- Evans, J.D. 1906. List of Coleoptera in the collection of J.D. Evans, Trenton, Ont., which have not heretofore been recorded as having been taken in Canada. Can. Entomol. 38:96-100.
- Fabricius, J.C. 1775. Systema entomologiae, sistens insectorum classes, ordines, genera, species, adjectis, synonymis, locis, descriptionibus, observationibus. Korte, Lipsiae. 832 pp.
- Fabricius, J.C. 1798. Supplementum entomologiae systematicae. Hafniae. 572 pp.
- Fabricius, J.C. 1801. Systema eleutheratorum. Vol. 1. Kiliae. xxiv + 506 pp.
- Fall, H.C. 1901. List of the Coleoptera of southern California with notes on habits and distribution and descriptions of new species. Occas. Pap. Calif. Acad. Sci. 8:1-282.
- Fall, H.C. 1928. Miscellaneous notes and descriptions (Coleoptera). Bull. Brook. Entomol. Soc. 23:236-240.
- Fall, H.C., and A.C. Davis. 1934. The Coleoptera of Santa Cruz Island, California. Can. Entomol. 66:143-144.
- Fattig, P.W. 1948. The Chrysomelidae or leaf beetles of Georgia. Emory Univ. Mus. Bull. No. 6, pp. 1-47.
- Favinger, J.J. 1962. A new insect pest. Cereal leaf beetle *Oulema melanopa* (L.). Outdoor Indiana 6:2-4.
- Favinger, J.J., and M.A. Moussa. 1963. The occurrence of the cereal leaf beetle, *Oulema melanopa* (L.), in Indiana, 1962. Proc. Indiana Acad. Sci. 72:167-168.
- Felt, E.P. 1900. Injurious and beneficial insects. Bull. N.Y. State Mus. 8:7-52.
- Fernald, H.T. 1909. A parasite on the asparagus beetle. J. Econ. Entomol. 2:278-279.
- Fitch, A. 1863. Insects infesting gardens. Trans. N.Y. State Agric. Soc., Eighth Report, New York. vol. 22, for 1862, pp. 659-691.
- Fitch, A. 1865. Reports on the noxious, beneficial and other insects of the State of New York. Albany. pp. 1-256.
- Fjelddalen, J. 1963. Insect species recorded as new pests on cultivated plants in Norway 1946-62. Nor. Entomol. Tidskr. 12:129-164.

- Force, D.C. 1966. Reactions of the three-lined potato beetle, *Lema trilineata* (Coleoptera: Chrysomelidae), to its host and certain nonhost plants. Ann. Entomol. Soc. Amer. 59:1112–1119.
- Fox-Wilson, G. 1942. The lily beetle, *Crioceris lili* Scop. J.R. Hortic. Soc. 67:165–168.
- Fox-Wilson, G. 1943. The lily beetle, *Crioceris lili* Scopoli: Its distribution in Britain (Coleoptera). Proc. R. Entomol. Soc. London, Ser. A., 18:85–86.
- Frost, C.A. 1929. *Lema palustris* Blatchley. Psyche 36:215.
- Fuller, A.S. 1869. The asparagus beetle (*Crioceris asparagi*, Linn.). Amer. Entomol. 1:114–15.
- Fuller, A.S. 1880. The asparagus beetle in Europe. Amer. Entomol. 3:3–5.
- Furieri, P. 1977. Lo spermio di *Lilioceris lili* Scop. (Coleoptera, Chrysomelidae). Redia. 60:113–123.
- Gahan, C.J. 1891. Mimetic resemblances between species of the coleopterous genera *Lema* and *Diabrotica*. Trans. Entomol. Soc. London, 1891. pp. 367–374.
- Gahan, C.J. 1900. Stridulating organs in Coleoptera. Trans. Entomol. Soc. London. Part 3, pp. 433–452.
- Gauthier, G. 1946. Insects of the season 1945 in Quebec. Can. Insect Pest Rev. 24:30–33.
- Gauthier, G. 1947. A lily beetle (*Lilioceris lili* Scop.). Can. Insect Pest Rev. 25:108.
- Gauthier, G. 1948. Insects of the season 1947 in Quebec. Can Insect Pest Rev. 26:94–97.
- Gauthier, G. 1949. Insects of the season 1948 in Quebec. Can. Insect Pest Rev. 27:94–99.
- Gauthier, G., and A. Doyle. 1950. Insects of the season 1949 in Quebec. Can. Insect Pest Rev. 28:73–77.
- Gauthier, G., and A. Doyle. 1951. Insects of the season 1950 in Quebec. Can. Insect Pest Rev. 29:77–81.
- Gauthier, G., and A. Doyle. 1952. Insects of the season 1951 in Quebec. Can. Insect Pest Rev. 30:82–86.
- Gemminger, M., and E. Harold. 1874. Catalogus Coleopterorum hucusque descriptorum synonymicus et systematicus. Monachii 11:3233–3478.

- Geoffroy, E.L. 1762. Histoire abrégée des insectes qui se trouvent aux environs de Paris, dans laquelle ces animaux sont rangés suivant un ordre méthodique. Paris. vol. 1, 523 pp.; vol. 2, 690 pp.
- Germar, E.F. 1824. Insectorum species novae aut minus cognitae, descriptionibus illustratae. Vol. I. Coleoptera. Halae. 624 pp.
- Gravenhorst, J.L.C. 1807. Vergleichende Übersicht des Linneischen und einiger neuern zoologischen Systeme. Gottingen. 476 pp.
- Green, G. 1939. The biology of *Lema sexpunctata* Oliv. J. Kans. Entomol. Soc. 12:128–131.
- Grensted, L.W. 1946. The meaning and correctness of the name *Lema melanopa* L., (Col. Chrysomelidae). Entomol. Mon. Mag., 4th Ser., 82:144.
- Gressitt, J.L. 1965. Chrysomelid beetles from the papuan subregion, I (Sagrinea, Zeugophorinae, Criocerinae). Pac. Insects 7:131–189.
- Gressitt, J.L., and S. Kimoto. 1961. The Chrysomelidae (Coleopt.) of China and Korea, Part I. Pac. Insects Mongr. 1A. 299 pp.
- Guérin-Ménéville, F.E. 1844. Insects. Iconographie du règne animal de G. Cuvier ou représentation d'après nature de l'une des espèces les plus remarquables et souvent non encore figures de chaque genre d'animaux; pouvant servir d'atlas à tous les traités de Zoologie. vol. 7, insectes, 1829–1838 (1844). J.B. Baillière, Paris. 576 pp.
- Hamilton, J. 1894. Catalogue of Coleoptera common to North America, northern Asia and Europe, with distribution and biology. Trans. Amer. Entomol. Soc. 21:345–416.
- Hamilton, J. 1895a. Catalogue of the Coleoptera of southwestern Pennsylvania, with notes and descriptions. Trans. Amer. Entomol. Soc. 22:317–380.
- Hamilton, J. 1895b. Coleoptera taken at Lake Worth, Florida—No. 11. Can. Entomol. 27:317–322.
- Harris, H.M. 1931. Twelve-spotted asparagus beetle in Iowa. J. Econ. Entomol. 24:1311.
- Harris, T.W. 1833. The insects of Massachusetts. Report in the Geology, Minerals, Botany and Zoology of Massachusetts. Part 4. Amherst. pp. 566–595.
- Hatch, M.H. 1924a. A list of Coleoptera from Charlevoix County, Michigan. Pap. Mich. Acad. Sci., Arts, Lett. 4:543–586.
- Hatch, M.H. 1924b. A preliminary list of the Coleoptera of the Cranberry Lake region, New York. New York State Coll. For., Tech. Pub. 17, 24:273–312.

- Hatch, M.H. 1927. Note on the varieties of *Crioceris asparagi* L. Bull. Brook. Entomol. Soc. 22:211.
- Hatch, M.H. 1938. A bibliographical catalogue of the injurious arachnids and insects of Washington. Univ. Wash. Publ. Biol. 1:163–223.
- Hatch, M.H. 1971. The beetles of the Pacific Northwest. Univ. Wash. Publ. Biol. 16:662.
- Hatch, M.H., and S. Beller. 1932. A preliminary catalogue of the Chrysomelidae of Oregon. Pan-Pac. Entomol. 8:102–108.
- Haynes, D.L., and S.H. Gage. 1981. The cereal leaf beetle in North America. Ann. Rev. Entomol. 26:259–287.
- Heffinger, C.P., W.W. Hopkins, and J.B. Hopkins. 1910. A list of Coleoptera collected at Concord, Mass. Proc. Thor. Mus. Nat. Hist. 1:7–10.
- Heinze, E. 1927a. Drie neue Criocerinen-Gattungen, drie neue *Lema*-Arten und (3. Beitrag zur Kenntnis der Criocerinen (Col. Chrysomel.)) Entomol. Bl. 23:161–170, 6 figs.
- Heinze, E. 1927b. Beitrag zur Kenntnis der Criocerinen (Col. Chrysomelid.). Entomol. Mitt. 16:138–142.
- Heinze, E. 1929. Übersicht der Arten des Afrikanischen Festlandes der Gattung *Hapsidolema* Heinze. Dtsch. Entomol. Z. 4:289–297.
- Heinze, E. 1930. Über afrikanische Criocerinen, vorzugsweise aus dem Kongo Museum Tervuren. Rev. Zool. Bot. Afr. 20(1):23–55, 3 figs.
- Heinze, E. 1931. Ein neues Criocerinen-Subgenus mit einer neuen Art. Entomol. Nach. 5:53–54.
- Heinze, E. 1937. Die Afrikanischen Arten der Gattung *Lilioceris* (Coleoptera Chrysomelidae). Mus. R. d'Hist. Nat. de Belg. Bull. 13:1–31.
- Heinze, E. 1943. Über Australische Criocerinen. Entomol. Bl. 39:22–28.
- Heinze, E., and W. Pinsdorf. 1964. Die Criocerinen Afrikas (Col. Chrysomelidae). Mus. G. Frey Entomol. Arb. b. 15, h. 2, pp. 334–569.
- Hendrickson, G.O. 1930. Studies on the insect fauna of Iowa prairies. Iowa State Coll. J. Sci. 6:49–179.
- Henshaw, S. 1874. List of Coleoptera collected in the vicinity of Cliftondale, Mass., June 12, 1873. Psyche 1:22–23.
- Henshaw, S. 1885. List of the Coleoptera of America, North America. Amer. Entomol. Soc., Philadelphia. 161 pp.
- Heyden, L. 1906. Die Varietäten der *Crioceris asparagi* L. und *macilenta* Weise. Entomol. Zeit. Wien. 25:123–26.

- Hicks, S.D. 1945. Additional notes on Coleoptera taken in Essex County, Ontario. *Can. Entomol.* 77:214.
- Hodson, W.E.H. 1929. The bionomics of *Lema melanopa*. L. (Criocerinae) in Great Britain. *Bull. Entomol. Res.* 20:5–14.
- Holdaway, F.G. 1941. Datura beetle *Lema trilineata* var. *californica* Schaeffer. Attacking eggplant and Irish potato. *Proc. Hawaii. Entomol. Soc.* 11:8.
- Horn, G.H. 1894 The Coleoptera of Baja California. *Proc. Calif. Acad. Sci.*, Ser. 2, 4:302–449.
- Horn, G.H. 1895. Coleoptera of Baja California. Supp. I. *Proc. Cal. Acad. Sci.*, Ser. 2, 5:225–259.
- Howard, L.O. 1895. Notes on the geographical distribution within the United States of certain insects injuring cultivated crops. *Proc. Entomol. Soc. Wash.* 3:219–226.
- Hubbard, H.G., and E.A. Schwarz. 1878. The Coleoptera of Michigan. *Proc. Amer. Philos. Soc.* 17:593–666.
- Hughes, J.H. 1944. List of Chrysomelidae known to occur in Ohio. *Ohio. J. Sci.* 44:129–142.
- Illiger, J. 1804. Nachtrag zu den Bemerkungen zu Tomus I. von Fabricii *Systema Eleutheratorum*. *Mag. Insekt.* 3:147–159.
- Illingworth, J.F. 1938. *Lema nigrovittata* Guérin. *Proc. Hawaii. Entomol. Soc.* for 1937. 10:11.
- International Commission on Zoological Nomenclature. 1985. International code of zoological nomenclature. Third edition. London, Charlesworth and Co. 338 pp.
- Jacoby, M. 1880. Family Crioceridae. *In* *Biologia Centrali-Americana*, Insecta. Coleoptera. 6:2–19.
- Jacoby, M. 1888. Family Crioceridae. *In* *Biologia Centrali-Americana*. Insecta. Coleoptera. 6(1) Supp.:8–57.
- Jacoby, M. 1903. Descriptions of the new genera and species of phytophagous Coleoptera obtained by Mr. H.L. Andrewes and Mr. T.R.D. Bell at the Nilgiri Hills and Kanara. *Ann. Soc. Entomol. Belg.* 47:80–128.
- Jacoby, M., and H. Clavareau. 1904. Coleoptera Phytophaga, Fam. Crioceridae. *In* P. Wytsman, ed., *Genera Insectorum*,. Fasc. 23, pp. 1–40, figs.
- Johnson, C.W. 1927. The insect fauna with reference to the flora and other biological features. Part I. Biological survey of the Mount Desert region. Philadelphia Wistar Inst. *Ann. Biol.* 246 pp.

- Johnson, H.L. 1915 Coleoptera found in the vicinity of Meriden, Connecticut. Entomol. News 26:307.
- Johnson, H.L. 1916. Additions to the Coleoptera of Meriden, Connecticut. Entomol. News 27:112–124.
- Joutel, L.H. 1900. [Insect notes]. J. N.Y. Entomol. Soc. 8:207
- Kaufmann, D.L. 1967. Notes on the biology of three species of *Lema* (Coleoptera: Chrysomelidae) with larval descriptions and key to described United States species. J. Kans. Entomol. Soc. 40:361–372.
- Kimoto, S., and J.L. Gressitt. 1979. Chrysomelidae (Coleoptera) of Thailand, Cambodia, Laos and Vietnam. I Sagrinae, Donaciinae, Zeugophorinae, Megalopodinae and Criocerinae. Pac. Insects 20:191–256.
- Klages, H.G. 1901. Supplement to Dr. Hamilton's list of the Coleoptera of southwestern Pennsylvania. Ann. Carn. Mus. 1:265–294.
- Knaus, W. 1901a. Additions to the list of Kansas Coleoptera for the years 1899 and 1900. Trans. Kans. Acad. Sci. 17:109–114.
- Knaus, W. 1901b. Collecting notes on Kansas Coleoptera. Can. Entomol. 33:110–115.
- Knaus, W. 1926. The Coleoptera of the Sandhill region of Medora, Reno County, Kansas. Entomol. News 37:262–266.
- Knowlton, G.F. 1951. Spotted asparagus beetle invades Utah. Brook. Entomol. Soc. 46:56.
- Knowlton, G.F., and C.J. Smith. 1935. Notes on Utah Scarabaeidae and Chrysomelidae (Coleoptera). Entomol. News 46:241–244.
- Kogan M., and R. Goeden. 1969. A photometric technique for quantitative evaluation of feeding preferences of phytophagous insects. Ann. Entomol. Soc. Amer. 62:319–322.
- Kogan, M., and R. Goeden. 1970a. The systematic status of *Lema trilineata daturaphila*, new name, with notes on the morphology of chemoreceptors of adults (Coleoptera: Chrysomelidae). Ann. Entomol. Soc. Amer. 63:529–537.
- Kogan, M., and R. Goeden. 1970b. The biology of *Lema trilineata daturaphila* (Coleoptera: Chrysomelidae) with notes on efficiency of food utilization by larvae. Ann. Entomol. Soc. Amer. 63:537–546.
- Kogan, M., and R. Goeden. 1970c. The host-plant range of *Lema trilineata daturaphila* (Coleoptera: Chrysomelidae). Ann. Entomol. Soc. Amer. 63:1175–1180.

- Kogan, M., and R. Goeden. 1970d. Morphology of the stridulatory organ and analysis of the sound produced by *Lema trilineata daturaphila* (Coleoptera: Chrysomelidae) Ann. Entomol. Soc. Amer. 63:1285–1289.
- Kogan, M., and R. Goeden. 1971. Feeding and host-selection behavior of *Lema trilineata daturaphila* larvae (Coleoptera: Chrysomelidae). Ann. Entomol. Soc. Amer. 64:1435–1448.
- Krauss, N. 1934. *Lema nigrovittata* Guérin. Proc. Hawaii. Entomol. Soc. 8:389.
- Krauss, N. 1935. *Lema nigrovittata* Guérin. Proc. Hawaii. Entomol. Soc. 9:13.
- Krauss, N. 1941. *Lema trilineata californica* Schaeffer. Proc. Hawaii. Entomol. Soc. 11:10.
- Krauss, N. 1944. *Lema trilineata californica* Schaeffer. Proc. Hawaii. Entomol. Soc. 12:7.
- Krauss, N. 1947. *Lema trilineata californica* Schaeffer. Proc. Hawaii. Entomol. Soc. 13:4.
- Krysan, J.L., R.F. Smith, and P.L. Guss. 1983. *Diabrotica barberi* (Coleoptera: Chrysomelidae) elevated to species rank based on behavior, habitat choice, morphometrics, and geographical variation of color. Ann. Entomol. Soc. Amer. 76:197–204.
- Lacordaire, J.T. 1845. Monographie des Coléoptères subpentamères de la famille des Phytophages. 1(1). Mem. Soc. R. Sci. Liege 3:1–740.
- Lacordaire, J.T., and F. Chapuis. 1874. Histoire naturelle des Insectes. Vol. 10. Paris. 455 pp.
- Latreille, P.A. 1829. In Cuvier, Les Crustacés, les Arachnides et les Insectes, Distribués en Famille Naturelles, Ouvrage Formant les Tomes 4 et 5 de Celui de M. le Baron Cuvier sur le Règne Animal. 2nd ed., vol. 5. Paris. 24 + 556 pp.
- LeConte, J.L. 1849. Coleopterous insects. In White, Statistics of the State of Georgia. Savannah. pp. 25–36.
- LeConte, J.L. 1859. The Coleoptera of Kansas and eastern New Mexico. Smithsonian. Contrib. Knowl. 2:1–58, plates.
- LeConte, J.L. 1876. Report upon new species of Coleoptera collected by the expedition for geographical surveys west of the 100th meridian, Lieut., Geo. M. Wheeler, Corps of Engineers, U.S. Army, in charge. Ann. Rp. Chief Engineers. Washington. pp. 516–520.
- LeConte, J.L. 1884. Short studies of North American Coleoptera. Trans. Amer. Entomol. Soc. 12:1–32.

- Leech, H.B., and J.W. Green. 1955. Plant association data for a few Arizona and New Mexico Coleoptera (Cleridae, Meloidae, Chrysomelidae, Cerambycidae). *Coleopt. Bull.* 9:27–28.
- Leng, C.W. 1911. Notes on Coleoptera collected in northern Georgia—II. *J. N.Y. Entomol. Soc.* 19:209–216.
- Leng, C.W. 1912. Collecting beetles in Georgia. *J. N.Y. Entomol. Soc.* 20:298.
- Leng, C.W. 1920. Catalogue of the Coleoptera of America, north of Mexico. J.D. Sherman, Mt. Vernon, NY. 470 pp.
- Leng, C.W. 1927. Supplement, 1919 to 1924 (inclusive) to Catalogue of the Coleoptera of America, north of Mexico. J.D. Sherman, Mt. Vernon, NY. 78 pp.
- Leng, C.W., and W.T. Davis. 1924. List of the Coleoptera of Staten Island, New York. *Proc. Stat. Isl. Inst. Arts. Sci.* 2:1–82.
- Leng, C.W., and A.J. Mutchler. 1914. A preliminary list of the Coleoptera of the West Indies as recorded to Jan. 1, 1914. *Bull. Amer. Mus. Nat. Hist.* 33:391–493.
- Leng, C.W., and A.J. Mutchler. 1933. Second and third supplements 1925–1932 (inclusive) to catalogue of the Coleoptera of America, north of Mexico. J.D. Sherman, Mt. Vernon, NY. 112 pp.
- Leonard, M.D. 1928. A list of the insects of New York with a list of the spiders and certain other allied groups. Cornell Univ. Agric. Exp. Stn., Mem. 101. 1121 pp.
- LeSage, L. 1983. Note sur la distribution presente et future du *Criocere* du *Criocere* du lys, *Liliocercis lili* (Scopoli) (Coleoptera: Chrysomelidae) dans l'est du Canada. *Nat. Can.* 110:95–97.
- Linell, M.L. 1897. New species of Coleoptera of the family Chrysomelidae, with a short review of the tribe Chlamydini. *Proc. U.S. Nat. Mus.* 20:473–485.
- Linnaeus, C. von. 1758. *Systema Naturae per regna tria naturae secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis*. Ed. 10. Holmiae. pp. 1–823.
- Lintner, J.A. 1882. First annual report on the injurious and other insects of the State of New York. Weed, Parsons & Co., Albany. 381 pp.
- Löding, H.P. 1945. Catalogue of the beetles of Alabama. *Geol. Surv. Ala. Monogr.* 11, 172 pp.
- Longley, W.E. 1905. [Insects of the Chicago area.] *Entomol. News* 16:125–127.
- Lucas, R. 1920. *Catalogus alphabeticus generum et subgenerum Coleopterorum orbis terrarum totius (famil., trib., subtr., sect. incl.)*. Pars 1. *Archiv Naturg. Abt. A, Heft.* 1–5, pp. 1–696.

- Lugger, O. 1890. (Asparagus beetles in Maryland and Virginia.) Proc. Entomol. Soc. Wash. 1:59.
- Lugger, O. 1899a. Coleoptera or beetles of Minnesota. Fifth Ann. Rp. State Exp. Stn. Univ. Minn. pp. 1-247.
- Lugger, O. 1899b. Beetles injurious to fruit. Minn. Agric. Exp. Stn. Bull. 66:220.
- Lutz, F.E. 1908. Notes on the inheritance of variations in the color pattern of *Crioceris asparagi*. Psyche. 15:50-52.
- MacNay, C.G. 1947. Summary for 1946. Can. Insect Pest Rev. 24:345-366.
- MacNay, C.G. 1953. Some first records of insects of known economic importance in Canada during the 10-year period 1942-51. Can. Insect Pest Rev. 30:282A.
- Malkin, B. 1941. An addition to the New York State list of Coleoptera, No. 5, Long Island records. Bull. Brook. Entomol. Soc. 36:209-212.
- Malkin, B. 1945. A supplement to the New York State list of Coleoptera, No. 6, additions and corrections. J. N.Y. Entomol. Soc. 53:93-116.
- Maltais, J.B. 1946. Field and vegetable crop insects of the season 1945 in southern Quebec. Can. Insect Pest Rev. 24:34-35.
- Mann, J.S., and J.P. Singh. 1979. Female reproductive system and genitalia of genus *Lema* (Criocerinae: Chrysomelidae: Coleoptera). Entomon 4:89-94.
- Mason, M.L., and F.A. Lawson. 1978. Effects of killing and preserving treatments on some leafbeetle larvae (Coleoptera: Chrysomelidae). J. Kans. Entomol. Soc. 51:398-400.
- Miczulski, B. 1973. Studies on the bionomics of *Oulema* spp. (Coleoptera, Chrysomelidae) in Poland. Rocz. Nauk Roln., Ser. E., 3:61-86.
- Mohr, K.H. 1985. Beiträge zur Insektenfauna der DDR: Coleoptera-Chrysomelidae: Donaciinae, Orsodacninae. Beitr. Entomol. 35:219-262.
- Moldenke, A.R. 1971. Host-plant relations of phytophagous beetles in Mexico. Pan-Pac. Entomol. 47:105-116.
- Monros, F. 1951. Notas sobre Criocerinae. Acta Zool. Lilloana 11:467-482, 6 figs.
- Monros, F. 1955. Notas sobre Criocerinae del sugenero *Quasilema* (Col. Chrysomelidae). Rev. Soc. Entomol. Argent. 8:35-44.
- Monros, F. 1960. Los Generos de Chrysomelidae (Coleoptera). Opera Lilloana III. Univ. Nac. Tucuman. 337 pp.

- Moore, I. 1937. A list of the beetles of San Diego County, California. Occas. Pap. San Diego Soc. Nat. Hist. 8:1–109.
- Moreno, I.G., and F.F. Bibby. 1943a. Insectos del Algodon y otras Malvaceas en las Regiones de Matamoros, Tams, y del Valle Bajo del Rio Bravo, Texas, E.U.A. Fitofilo 2:20–60.
- Moreno, I.G., and F.F. Bibby. 1943b. Insectos del Algódon y otras Málváceas en las Regiones de Matamoros, Tams, y del valle bajo del Rio Bravo, Texas, E.U.A. Fitofilo 2:62–110.
- Müller, J. 1907. Coleopterologische Notizen. Wien. Entomol. Zeit. 26:7–11.
- Müller, O.F. 1764. Fauna insectorum Fridrichsdalina sive methodica descriptio insectorum agri Fridrichdalensis, cum charicteribus genericis et specificis, nominibus trivialibus, locis natalibus, inonibus allegatis, novisque pluribus speciebus additis. Hafniae et Lipsiae. p. xxiv.
- Myser, W.C., and W.B. Schultz. 1967. Sexing the adult cereal leaf beetle, *Oulema melanopus* (Coleoptera: Chrysomelidae). Ann. Entomol. Soc. Amer. 60:1329.
- Notman, H. 1920. Coleoptera collected at Schoharie, N.Y. June 9–14, 1918, with descriptions of new species. J. N.Y. Entomol. Soc. 28:14–31.
- Oliver, A.G. 1791. Encyclopedia methodique. Vol. 6. Paris. pp. 1–704.
- Olivier, A.G. 1808. Entomologie ou histoire naturelle des insectes. Vol. 6. Paris. pp. 613–1104.
- Omer-Cooper, J., and P. Miles. 1951. On *Lema trilineata*—a beetle closely resembling the tobacco slug, attacking the Cape gooseberry. S. Afr. J. Sci. 47:330–333.
- Pallister, J.C. 1953. The leaf beetles of north central Mexico collected on the David Rockefeller Mexican expedition (Coleoptera, Chrysomelidae). Amer. Mus. Novit. No. 1623, pp. 1–95.
- Palmquist, S. 1945. Skanska skalbaggs fynd. Opusc. Entomol. 10:109–119.
- Paxson, O.S. 1908. Numerical distribution of some insects. Entomol. News 19:324–337.
- Peschken, D.P. 1984a. *Cirsium arvense* (L.) Scop., Canada thistle (Compositae). In Biological Control Programmes Against Insects and Weeds in Canada 1969–1980. Commonw. Agric. Bur. England. pp. 139–146.
- Peschken, D.P. 1984b. Host range of *Lema cyanella* (Coleoptera: Chrysomelidae) a candidate for biocontrol of Canada thistle, and of four stenophagous foreign thistle insects in North America. Can. Entomol. 116:1377–1384.

- Peschken, D.P., and G.R. Johnson. 1979. Host specificity and suitability of *Lema cyanella* (Coleoptera: Chrysomelidae), a candidate for the biological control of Canada thistle (*Cirsium arvense*). Can. Entomol. 111:1059–1068.
- Peterson, A. 1957. Larvae of insects. Part II. Edwards Bros., Ann Arbor, MI. 416 pp.
- Peterson, B.L., and G.P. Dively. 1981. Effect of feeding by *Lema trivittata* (Coleoptera: Chrysomelidae) on the growth, reproduction and competitive ability of jimsonweed *Datura stramonium* in soybeans. Proc. Ann. Meet. N.E. Weed Soc. 35:78.
- Pettit, J. 1872. List of Coleoptera taken at Grimsby, Ont. Can. Entomol. 4:12–14.
- Petitpierre, E. 1980. Chromosome studies on primitive chrysomelids. 1. A survey of six species of Criocerinae (Coleoptera, Chrysomelidae). Cytobios 28:179–185.
- Pic, M. 1894. Pour prendre date. Bull. Soc. Entomol. Fr. cclxxxiv–cclxxxv.
- Pic, M. 1898. Sur quelques Coléoptères phytophages d'akbes. Misc. Entomol. 6:155–156.
- Pic, M. 1900. Notes descriptives et biologiques. L'Échange, Rev. Linn. 16:65–66.
- Pic, M. 1906. Sur *Crioceris asparagi* L. et ses variétés (Col.). Bull. Soc. Entomol. Fr. 8:119–123.
- Pic, M. 1928. Contribution a l'étude du genre *Lema* F. (Col.). Bull. Soc. Entomol. Fr. 1928:95–96.
- Pic, M. 1932. Nouveautés diverses. Mel. Exot.-Entomol. 60:1–36.
- Pic, M. 1936. Nouveautés diverses. Mel. Exot.-Entomol. 68:10–36.
- Pic, M. 1941. Diagnoses de Coléoptères exotiques (cont'd.). L'Échange, Rev. Linn. 57:6–9.
- Pic, M. 1947. Coleopteres du globe. L'Echange, Rev. Linn. 63:9–12.
- Popenoe, E.A. 1877. List of Kansas Coleoptera. Trans. Kans. Acad. Sci. 5:21–40.
- Powell, E.F. 1941. Relationships within the family Chrysomelidae (Coleoptera) as indicated by the male genitalia of certain species. Amer. Mid. Nat. 25:148–195.
- Procter, W. 1938. The insect fauna with references to methods of capture, food plants, the flora and other biological features. Part VI. Biological survey of the Mount Desert region. Wistar Inst., Philadelphia. pp. 1–496.

- Procter, W. 1946. Biological Survey of the Mount Desert Region. Part VII. Wistar Inst., Philadelphia. 566 pp.
- Provancher, L. 1877. Petite entomologique du Canada. Vol. I. Coléoptères. p. 648.
- Reinecke, O. 1897. Westward. Entomol. News 8:13–14.
- Reitter, E. 1912. Fauna Germanica. Die Käfer des deutschen Reiches 4:1–236.
- Richardson, W.D. 1893. Notes on *Lema sayi*. Proc. Entomol. Soc. Wash. 2:240.
- Riley, C.V. 1869. First annual report on the noxious, beneficial and other insects of the State of Missouri, made to the State board of agriculture pursuant to an appropriation for the purpose from the legislature of this State. Ellwood Kirby, Jefferson City, MO. 181 pp.
- Riley, C.V. 1893. Report on a small collection of insects made during the Death Valley expedition. U.S. Dep. Agric., N. Amer. Fauna, No. 7, pp. 235–252.
- Rosewell, O.W. 1922. Insects of the yellow thistle (Hem., Col., Lepid., Dip., Hym.). Entomol. News 33:176–180.
- Rossi, P. 1790. Fauna etrusca sistens insecta quae in provinciis Florentina et Pisana praesertim collegit. Vol. 1. Liburni. 272 pp.
- Ruppel, R.E., and M.E. Smith. 1965. Sound production by the cereal leaf beetle. Ann. Entomol. Soc. Amer. 58:936.
- Sailsbury, M.B. 1943a. The comparative morphology and taxonomy of some larval Criocerinae (Coleoptera, Chrysomelidae). Bull. Brook. Entomol. Soc. 38:59–74.
- Sailsbury, M.B. 1943b. The comparative morphology and taxonomy of some larval Criocerinae (Coleoptera, Chrysomelidae). Bull. Brook. Entomol. Soc. 38:128–139.
- Sanderson, E.D. 1900. The larvae of *Donacia piscatrix*, Lac., and *crassipes*, Fab. Can. Entomol. 32:249–263.
- Saunders, W., and E.B. Reed. 1871. Report of Messrs. W. Saunders and E.B. Reed, on the Colorado potato beetle—*Doryphora 10 lineata* Say. Can. Entomol. 3:41–51.
- Say, T. 1824. Descriptions of coleopterous insects collected in the late expedition to the Rocky Mountains, performed by order of Mr. Calhoun, Secretary of War, under the command of Major Long. J. Acad. Nat. Sci. Philadelphia 3:403–462.

- Say, T. 1827. Descriptions of new species of coleopterous insects inhabiting the United States. J. Acad. Nat. Sci. Philadelphia. 5:293-304.
- Schaeffer, C. 1905. Some additional new genera and species of Coleoptera found within the limit of the United States. Sci. Bull. Brook. Inst. Arts, Sci. 1:141-179.
- Schaeffer, C. 1920. Synonymical and other notes on some species of the family Chrysomelidae and descriptions of new species. J. N.Y. Entomol. Soc. 27:307-340.
- Schaeffer, C. 1931. [The variation of *Lema trilineata*.] Bull. Brook. Entomol. Soc. 26:148-149.
- Schaeffer, C. 1933. Short studies in the Chrysomelidae (Coleoptera). J. N.Y. Entomol. Soc. 41:297-325.
- Schmelter, H. 1878. Coleoptera of the neighborhood of New York. Bull. Brook. Entomol. Soc. 1:55.
- Schmidt, C.T. 1935. *Lema nigrovittata* Guérin. Proc. Hawaii. Entomol. Soc. 9:23.
- Schmidt, C.T. 1937. (*Lema nigrovittata* Guérin). Proc. Hawaii. Entomol. Soc. 9:364.
- Schmitt, M. 1985. On the phylogeny of the Criocerinae (Coleoptera, Chrysomelidae). Entomography 3:393-401.
- Schoemaker, E. 1910. [Records of beetles collected]. J. N.Y. Entomol. Soc. 18:134-135.
- Schröder, C. 1897. Ein Gartenbau-Schadling *Crioceris lili* Scop. Illust. Wochensch. Entomol. 2:516-518.
- Schuster, M. 1905. [New names.] Zool. Gart. 46:212-213.
- Schwarz, E.A. 1878. The Coleoptera of Florida. Proc. Amer. Philos. Soc. 17:353-472.
- Schwarz, E.A. 1890. [Spread of the asparagus beetle.] Proc. Entomol. Soc. Wash. 1:58-59.
- Science News Letter. 1962. Entomology. Foreign pest invades Great Lakes States. Sci. News Lett. 82:133.
- Science News Letter. 1963 Entomology. Alien beetle on rampage. Sci. News Lett. 84:83.
- Scopoli, I.A. 1763. Entomologia carniolica exhibens insecta carnioliae indigena et distributa in ordines, genera, species, varietates. I.T. Trattner, Vindobonae. 420 pp.

- Scudder, S.H. 1891. Some old correspondence between Harris, Say and Pickering—IV. *Psyche* 6:169–172.
- Scudder, S.H. 1899. Manuscript notes by the late T.W. Harris on Say's insects and papers—II. *Psyche* 8:411–414.
- Seamans, H.L. 1945. [Lily leaf beetle.] *Can. Insect Pest. Rev.* 23:214.
- Seenno, T.N., and J.A. Wilcox. 1982. Leaf beetle genera (Coleoptera: Chrysomelidae). *Entomography* 1:1–221.
- Selman, B.J., and R.F. Smith. 1967. *Crioceris* Muller, 1764 and *Lema* Fabricius, 1798 (Insecta, Coleoptera): Proposed designation of type-species under the plenary powers. *Z.N. (S.)* 1786. *Bull. Zool. Nomen.* 24:116–118.
- Selman, B.J., and R.F. Smith. 1968. *Crioceris* Müller, 1764 and *Lema* Fabricius, 1789 (Insecta, Coleoptera): Emendation to the proposed designation of type-species under the plenary powers. *Z.N.(S.)* 1786. *Bull. Zool. Nomen.* 25:73.
- Sengupta, G.C. 1957. On the biology of *Lema praeusta* Fab. *J. Econ. Entomol.* 50:471–474.
- Sharp, D., and F. Muir. 1912. The comparative anatomy of the genital tube in Coleoptera. *Trans. Entomol. Soc. London.* pt. 3, pp. 477–642.
- Slobodyanyuk, V.Y. 1976. [A useful species of *Lema*.] *Rev. Appl. Entomol., Ser. A.* 64:1849.
- Slosson, A.T. 1893. Spring collecting in northern Florida. *J. N.Y. Entomol. Soc.* 1:147–152.
- Slosson, A.T. 1902. Additional list of insects taken in alpine region of Mt. Washington. *Entomol. News* 13:319–321.
- Smith, E.H. 1979. Techniques for the dissection and mounting of the male (aedeagus) and female (spermatheca) genitalia of the Chrysomelidae (Coleoptera). *Coleopt. Bull.* 33:93–103.
- Smith, F.F., and C.F. Doucette. 1953. Insects and other pests of lilies. *In* The Lily Yearbook. North Amer. Lily Soc., Washington, DC. 6:13–29.
- Smith, J.B. 1884. Meeting of the entomological club of the American Association for the Advancement of Science. *Can. Entomol.* 16:181–186.
- Smith, J.B. 1890. Catalogue of insects found in New Jersey. *Geol. Surv. N.J.* 486 pp.
- Smith, J.B. 1892. [A slowly spreading insect, *Crioceris 12-punctatus* L.]. *Entomol. News* 3:207.

- Smith, J.B. 1897. [Collection notes.] *Entomol. News*. 8:181.
- Smith, J.B. 1900. *Insects of New Jersey*. State Board Agric., Trenton. 755 pp.
- Smith, J.B. 1910. Report of the Insects of New Jersey. *Ann. Rep. New Jersey State Mus.* 1909, pp. 13–880.
- Smith, R.C., E.G. Kelly, G.A. Dean, and others. 1943. Common insects of Kansas. *Kans. State Board Agric. Rep.* 62:1–440.
- Smith, S.G. 1953. Chromosome numbers of Coleoptera. *Heredity* 7:31–48.
- Snow, F.H. 1903. Lists of Coleoptera and Lepidoptera collected in Hamilton, Morton and Clark Counties, Kansas, 1902 and 1903. *Kans. Univ. Sci. Bull.* 2:191–208.
- Snow, F.H. 1904. Lists of Coleoptera, Lepidoptera, Diptera and Hemiptera collected in Arizona by the entomological expeditions of the University of Kansas in 1902 and 1903. *Kans. Univ. Sci. Bull.* 2:323–350.
- Snow, F.H. 1906. Some results of the University of Kansas entomological expeditions to Arizona. *Trans. Kans. Acad. Sci.* 20:155–181.
- Stevens, N.M. 1909. Further studies on the chromosomes of Coleoptera. *J. Exp. Zool.* 6:101–114.
- Stickney, F.S. 1923. The head-capsule of Coleoptera. *Ill. Biol. Monogr.* 8:1–104.
- Suffrian, E. 1841a. Fragmente zur genauern Kenntniss deutscher Käfer. *Entomol. Zeit. Stett.* 2:19–25.
- Suffrian, E. 1841b. Fragmente zur genauern Kenntniss deutscher Käfer. *Entomol. Zeit. Stett.* 2:38–47.
- Suffrian, E. 1841c. Fragmente zur genauern Kenntniss deutscher Käfer. *Entomol. Zeit. Stett.* 2:66–74.
- Suffrian, E. 1841d. Fragmente zur genauern Kenntniss deutscher Käfer. *Entomol. Zeit. Stett.* 2:97–106.
- Suffrian, E. 1843. Entomologische Bemerkungen. *Entomol. Zeit. Stett.* 4:122–125.
- Suffrian, E. 1846. Bemerkungen zur den in Lacordaire's Monographie des Coléoptères subpentamères de la famille des Phytophages vorkommenden deutschen Arten. *Entomol. Zeit. Stett.* 7:152–160.
- Suffrian, E. 1847. Zur Kritik einiger Käferarten, nach vergleich der Typen aus der Fabricius'schen Sammlung. *Entomol. Zeit. Stett.* 8:98–102.

- Suffrian, E. 1863. Synonymische Miscellaneen. Entomol. Zeit. Stett. 24:225–229.
- Suffrian, E. 1866. Verzeichniss der von Dr. Gundlach auf der Insel Cuba gesammelten Chrysomelinen. Arch. Naturgesch. 32:281–347.
- Suffrian, E. 1874. Geänderte Namen. Coleop. Hefte. 12:152.
- Surface, H.A. 1906. Report of personal experiments. Experiments with asparagus beetle. Penn. State Dep. Agric., Mon. Bull. Div. Zool. 4:6–9.
- Swezey, O.H. 1935. [*Isodromus axillaris* Thumb. eating eggs of *Lema nigrovittata*.] Proc. Hawaii. Entomol. Soc. 9:21.
- Swezey, O.H. 1943. Notes: *Lema trilineata californica* Schaeffer. Proc. Hawaii. Entomol. Soc. 11:269.
- Swezey, O.H., and Dr. Wakabayashi. 1938. *Lema nigrovittata* Guérin. Proc. Hawaii. Entomol. Soc. 10:13.
- Szabolcs, J. 1977. Sechs neue Aberrationen von *Crioceris* Fourc. (Coleoptera, Chrysomelidae) in Ungarn. Rovart. Kozl. Folia Entomol. Hung. Ser. Nova. 30:190–191.
- Tanner, V.M. 1934. Coleoptera of Zion National Park. No. 2. Ann. Entomol. Soc. Amer. 27:43–49.
- Taylor, R.G., and D.G. Harcourt. 1975. The distributional pattern of *Crioceris asparagi* (L.) (Coleoptera: Chrysomelidae) on asparagus. Proc. Entomol. Soc. Ont. 105:22–28.
- Tempère, G. Régime alimentaire anormal de “*Crioceris lili*” Scop. (Col. Chrysomelidae). Act. Soc. Linn. Bordeaux 78:131–133.
- Terrazas, L.J. 1958. Introducción al estudio de la biología y control de *Lema nigrovittata* (Guérin) en Chapingo, Mex. Mem. Prim. Cong. Nac. Entomol. Fitop. pp. 124–131.
- Thomas, C.A. 1943. Belladonna insects in Pennsylvania. J. Econ. Entomol. 36:630–632.
- Thomson, C.G. 1866. Skandinaviens Coleoptera. Vol. 8. Lund. 409 + 75 pp.
- Townsend, C.H.T. 1885. A list of Coleoptera collected in Louisiana on or south of parallel 30. Can. Entomol. 17:66–73.
- Townsend, C.H.T. 1889. Contribution to a list of the Coleoptera of the lower peninsula of Michigan. Psyche 5:231–235.
- Tuthill, L.D. 1949. *Oechalia pacifica* feeding on *Lema trilineata californica*. Proc. Hawaii. Entomol. Soc. 13:330.

- Twinn, C.R. 1946a. A summary of the more important insect conditions in Canada in 1945. 76th Ann. Rep. Entomol. Soc. Ont. pp. 49–55.
- Twinn, C.R. 1946b. A summary of the more important insect conditions in Canada in 1945. Can. Insect Pest Rev. 24:1–8.
- Ulke, H. 1902. A list of the beetles of the District of Columbia. Proc. U.S. Nat. Mus. 25:1–57.
- U.S. Department of Agriculture. 1958. Insects not known to occur in the United States. A leaf beetle (*Lema melanopa* L.). U.S. Dep. Agric., Coop. Econ. Insect Rep. 8:47–48.
- U.S. Department of Agriculture. 1972. Cereal leaf beetle *Oulema melanopus* L. selected references 1968–1970. U.S. Dep. Agric. Coop. Econ. Insect Rep. 22:343–346.
- Van Alphen, J.J.M., and H. Boer. 1980. Avoidance of scramble competition between larvae of the spotted asparagus beetle, *Crioceris duodecimpunctata* L. (Chrysomelidae), by discrimination between unoccupied and occupied asparagus berries. Neth. J. Zool. 30:136–143.
- Van Zwaluwenburg, R.H. 1938. *Lema nigrovittata* Guér. Proc. Hawaii. Entomol. Soc. 10:9.
- Van Zwaluwenburg, R.H. 1947. *Lema* enemies in California. Proc. Hawaii. Entomol. Soc. 13:23.
- Varma, B.K. 1955a. Phylogenetic study of the family Chrysomelidae, Coleoptera. Curr. Sci. 24:18–19.
- Varma, B.K. 1955b. Taxonomic value of spermathecal capsules as subfamily characters among the Chrysomelidae (Coleoptera). Indian J. Entomol. 17:189–192.
- Venturi, F. 1942. La "*Lema melanopa*" L. (Coleoptera, Chrysomelidae). Redia 28:11–88.
- Verdcourt, B. 1946a. Notes on the asparagus beetle (*Crioceris asparagi*, L.). Part I: Variation. Entomol. Rec. J. Var. 58:123–124.
- Verdcourt, B. 1946b. Notes on the asparagus beetle, *Crioceris asparagi*, L. Part II: Variation (continued). Entomol. Rec. J. 58:135–136.
- Verdcourt, B. 1946c. Notes on the asparagus beetle (*Crioceris asparagi*, L.). Part III: Miscellaneous anatomy. Entomol. Rec. J. 58:145.
- Verdcourt, B. 1947. Period of activity of the asparagus beetle (*Crioceris asparagi* L.). Entomol. Rec. J. 49:79–80.
- Verma, K.K. 1985. Male reproductive organs as taxonomic characters for a broad classification of Chrysomelidae. Entomography 3:485–487.

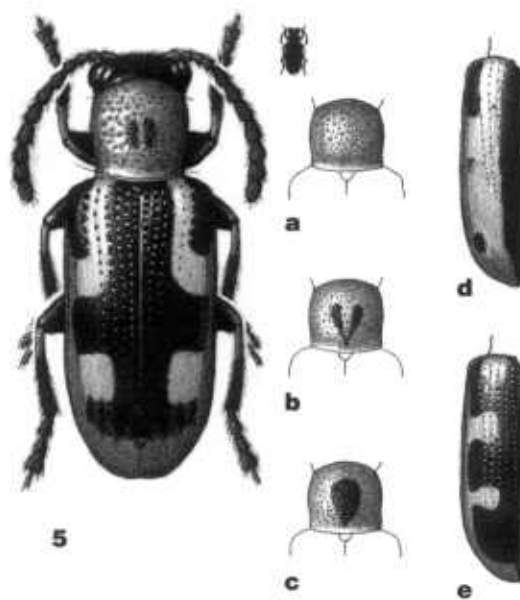
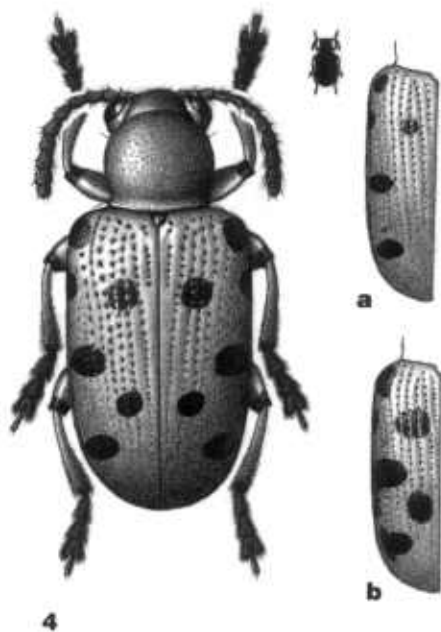
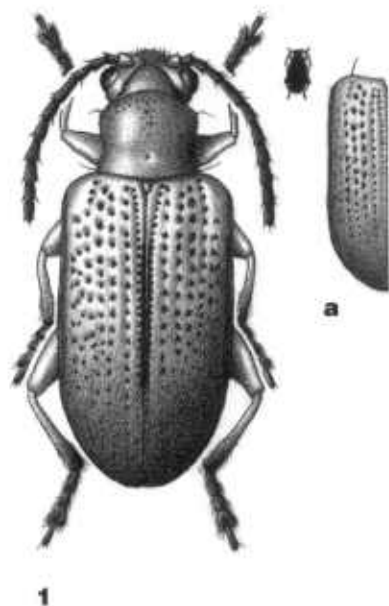
- Walker, C.M. 1899. The sound producing organs of *Lema trilineata*. Entomol. News 10:58–59.
- Walsh, B.D. 1866. The old-fashioned potato bugs. Pract. Entomol. 2:25–27.
- Walsh, B.D., and C.V. Riley. 1868. The three-lined leaf beetle (*Lema trilineata*, Olivier). Amer. Entomol. 1:26–27.
- Walsh, B.D., and C.V. Riley. 1869a. The asparagus beetle (*Crioceris asparagi*, Linn.). Amer. Entomol. 1:114–115.
- Walsh, B.D., and C.V. Riley. 1869b. Insects infesting the sweet-potato. Amer. Entomol. 1:234–238.
- Waltl, J. 1835. Reise durch Tyrol, Oberitalien und Piemont nach dem südlichen Spanien. 247 pp.
- Webster, F.W. 1897. Notes on various species of Coleoptera. J. N.Y. Entomol. Soc. 5:201–205.
- Weise, J. 1889. Forcipes verschiedener Arten von Donaciinen etc. Dtsch. Entomol. Z. 33:417–418.
- Weise, J. 1901. Ostafrikanische Criocerinen. Arch. Naturgesch. 67:145–163.
- Wellso, S.G., J.A. Webster, and R. Ruppel. 1970. A selected bibliography of the cereal leaf beetle, *Oulema melanopus* (Coleoptera: Chrysomelidae). Bull. Entomol. Soc. Wash. 16:85–88.
- Wellso, S., Chung Lee, and R. Hoxie. 1972. Inheritance of a dark mutant of the cereal leaf beetle. Ann. Entomol. Soc. Amer. 65:558–564.
- Wenzel, H.W. 1896. [Collection notes.] Entomol. News 7:281.
- Whelan, D.B. 1936 Coleoptera of an original prairie area in eastern Nebraska. J. Kans. Entomol. Soc. 9:111–115.
- White, R.E. 1981. Homonymy in world species-group names of Criocerinae (Coleoptera: Chrysomelidae). U.S. Dep. Agric. Tech. Bull. 1629, 69 pp.
- White, R.E. 1991. Revalidation of two species of American *Lema* (Coleoptera: Chrysomelidae). Coleopterists Bull. 45:270–272.
- White, R.E., and W.H. Day. 1979. Taxonomy and biology of *Lema trivittata* Say, a valid species with notes on *L. trilineata* (Oliv.) (Coleoptera: Chrysomelidae). Entomol. News. 90:209–217.
- Wickham, H.F. 1896a. The Coleoptera of Canada. XV. The Chrysomelidae of Ontario and Quebec. Can. Entomol. 28:67–74.

- Wickham, H.J. 1896b. A list of some Coleoptera from the northern portions of New Mexico and Arizona. Bull. Lab. Nat. Hist., State Univ. Iowa 3:153–171.
- Wickham, H.J. 1902. A catalogue of the Coleoptera of Colorado. Bull. Lab. Nat. Hist., State Univ. Iowa 5:217–310.
- Wickham, H.J. 1909. A list of the Coleoptera of Iowa. Bull. Lab. Nat. Hist., State Univ. Iowa 6:1–40.
- Wilcox, J.A. 1954. Leaf beetles of Ohio (Chrysomelidae: Coleoptera). Ohio Biol. Surv., Bull. 43, 8:353–506.
- Wilcox, J.A. 1974a. Checklist of the Chrysomelidae of Canada and United States. Family No. 104. N. Amer. Beetle Fauna Proj. Biol. Res. Inst. Amer. Inc. 82 pp.
- Wilcox, J.A. 1974b. Checklist of the Chrysomelidae of Canada, United States, Mexico, Central America, and the West Indies. Family No. 104. Biol. Res. Inst. Amer. Inc. 165 pp.
- Wilcox, J.A. 1979. Leaf beetle host plants in northeastern North America (Coleoptera: Chrysomelidae). Biol. Res. Inst. Amer. Inc. 30 pp.
- Williams, F.X. 1938. [The striped datura beetle]. Proc. Hawaii. Entomol. Soc. 10:9.
- Wilson, M.C., and R.E. Shade. 1966. Survival and development of larvae of the cereal leaf beetle, *Oulema melanopa* (Coleoptera: Chrysomelidae), on various species of Graminae. Ann. Entomol. Soc. Amer. 59:170–173.
- Wilson, M.C., R.E. Treece, and R.E. Shade. 1972. Infestations of oats by the cereal leaf beetle in 1970 and 1971. U.S. Dep. Agric., Coop. Econ. Insect Rep. 22:371–378.
- Wright, J.F., and J. Whitehouse. 1941. Additions to the list of Cincinnati Coleoptera. Bull. Brook. Entomol. Soc. 26:69–73.
- Yadav, J.S., and R.K. Pillai. 1974. Chromosomes of *Lema* Fabr., (Chrysomelidae: Coleoptera). Nucleus 17:96–100.
- Zabriskie, J.L. 1900. [Stridulating organ of *Lema trilineata*.] J. N.Y. Entomol. Soc. 8:206.
- Zesch, F., and O. Reinecke. 1881. List of Coleoptera observed and collected in the vicinity of Buffalo. Bull. Buffalo Soc. Nat. Sci. 4:2–17.

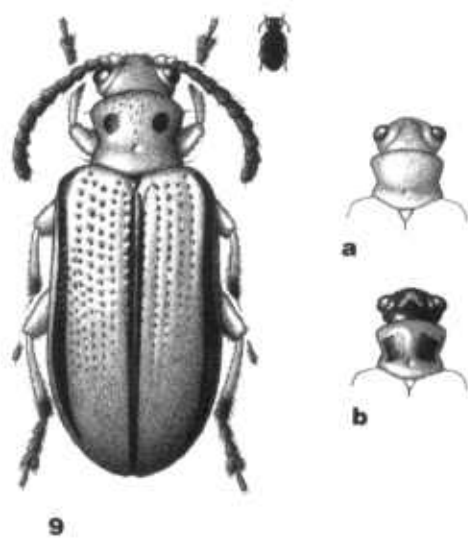
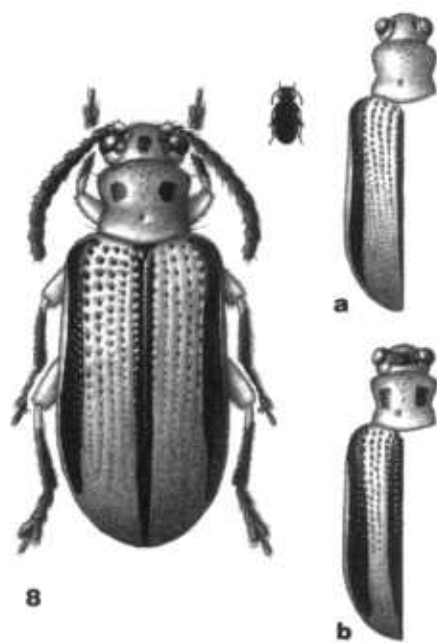
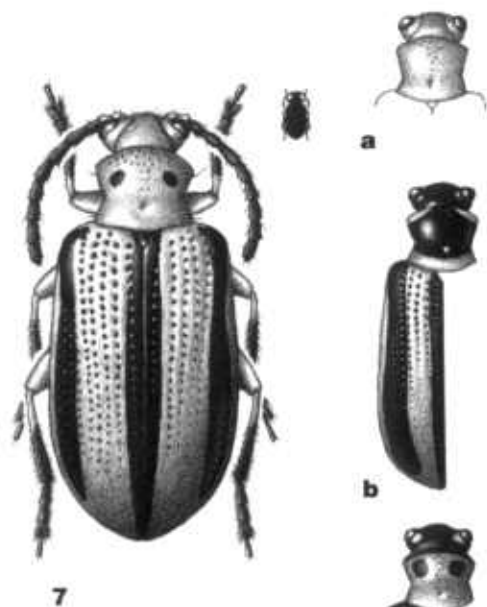
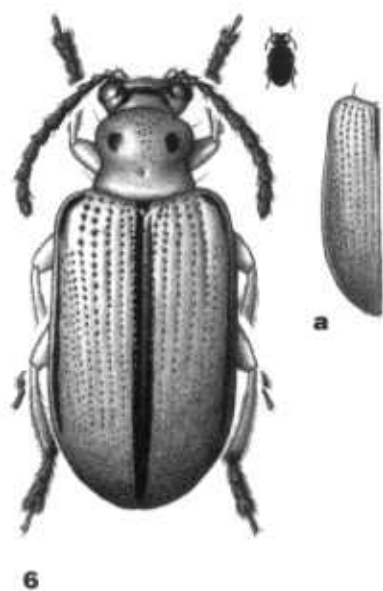
Figures 1–45.

Solid black drawings show actual size; partial drawings show the extent of variations in pattern and tone.

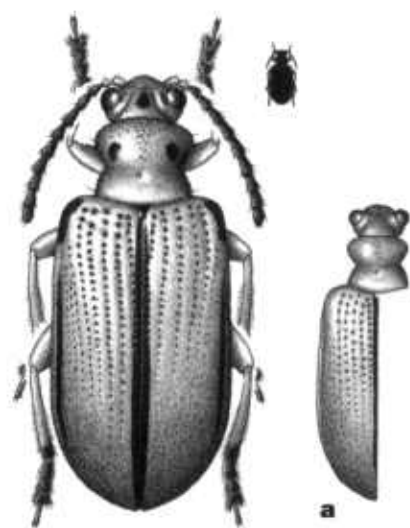
1. *Neolema jacobina*. 2. *Lilioceris lili*. 3. *Lema puncticollis*.
4. *Crioceris duodecimpunctata*. 5. *Crioceris asparagi*.
-



6. *Lema melanofrons*. 7. *Lema trilinea*: a. from Carpinteria, CA;
b. from Rock Creek Park, DC. 8. *Lema trivittata medionota*.
9. *Lema trivittata trivittata*.
-



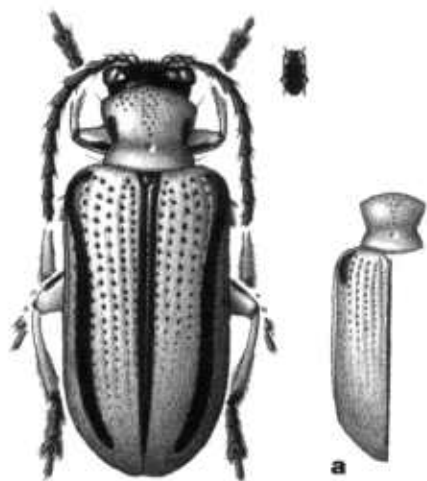
10. *Lema pubipes*. 11. *Lema maderensis*. 12. *Lema nigrovittata*.
13. *Lema confusa*.



10



11

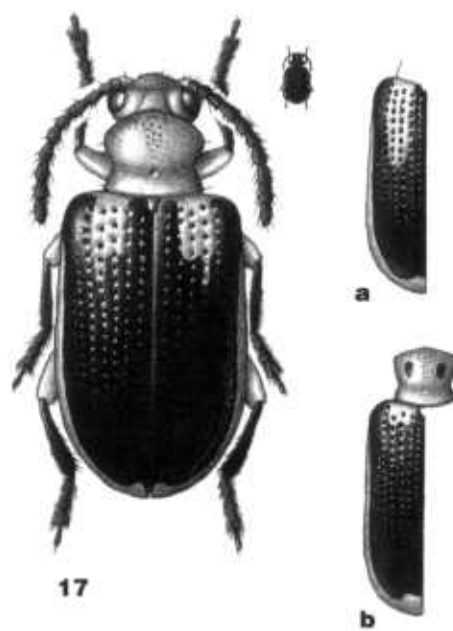
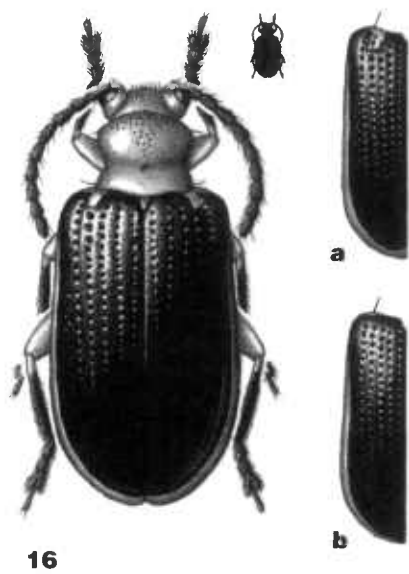
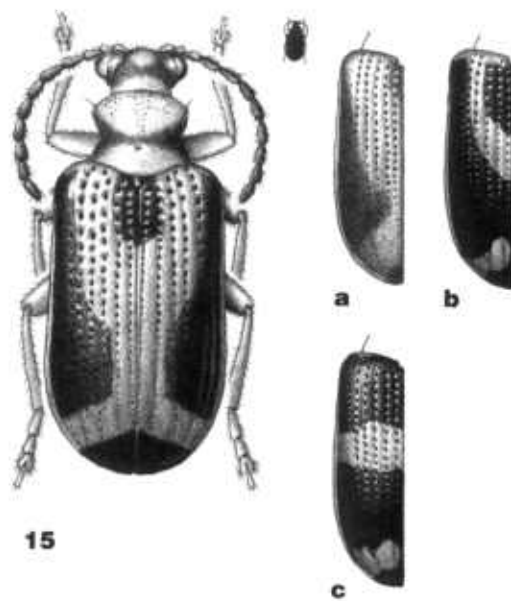
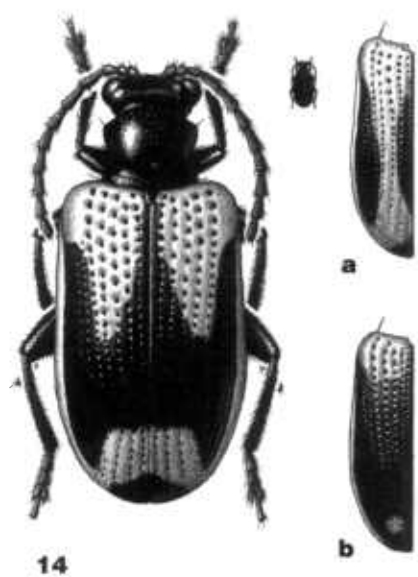


12



13

14. *Lema trabeata*. 15. *Lema opulenta*. 16. *Lema circumvittata*.
17. *Lema conjuncta*.



18. *Lema solani*. 19. *Lema balteata*. 20. *Neolema ovalis*.
21. *Neolema ephippium*.



18



a



b



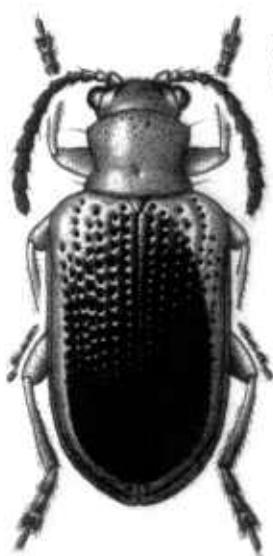
19



a



b



20



a



b

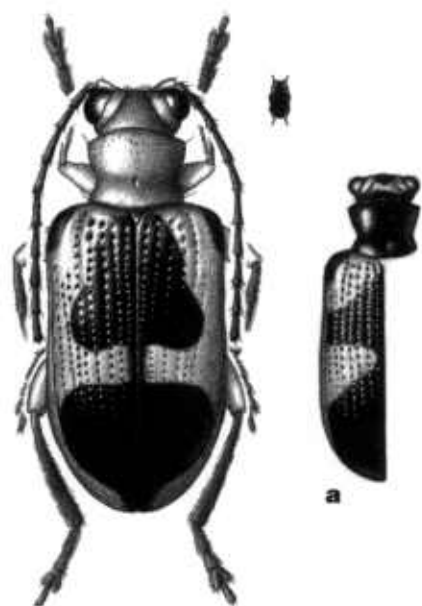


21

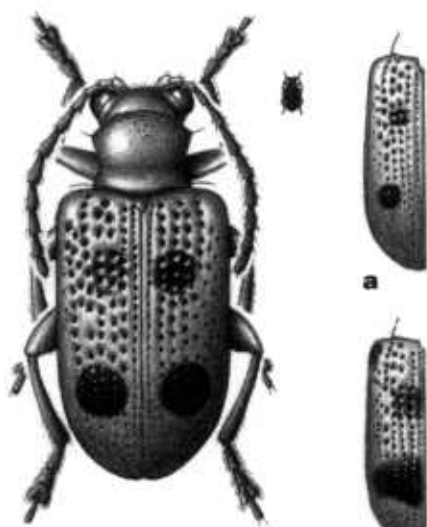


a

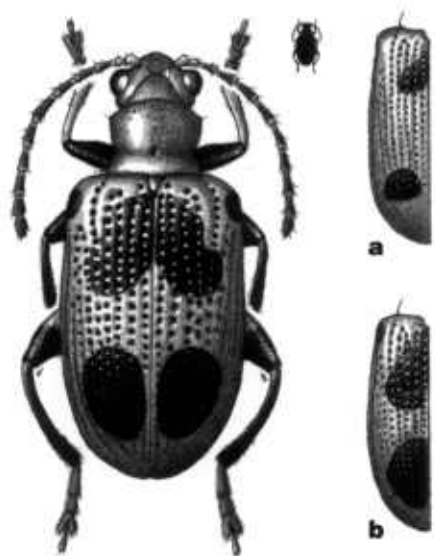
22. *Neolema adunata*. 23. *Neolema quadriguttata*.
24. *Neolema cordata*. 25. *Neolema sexpunctata*.



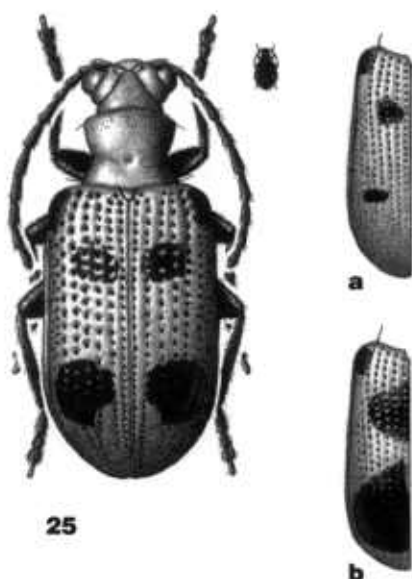
22



23

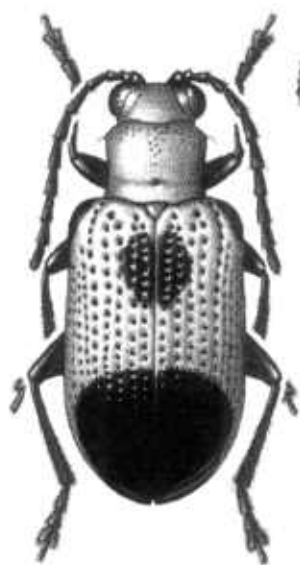


24

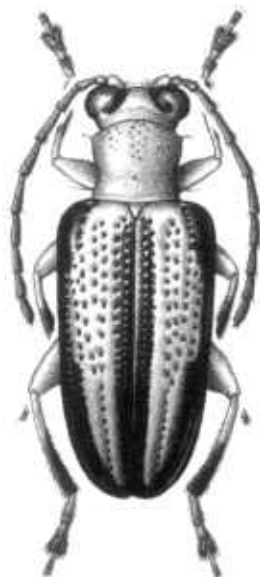


25

26. *Neolema gundlachiana*. 27. *Oulema coalescens*.
28. *Oulema margineimpressa*. 29. *Oulema concolor*.
30. *Oulema sayi*.
-



26



27



28



29



30



a



b

31. *Oulema longipennis*. 32. *Oulema arizonae*. 33. *Oulema elongata*. 34. *Oulema variabilis*. 35. *Oulema simulans*.



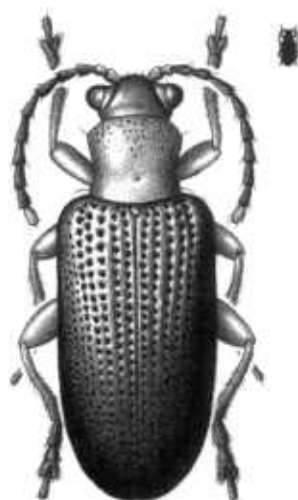
31



32



33



34



a



b

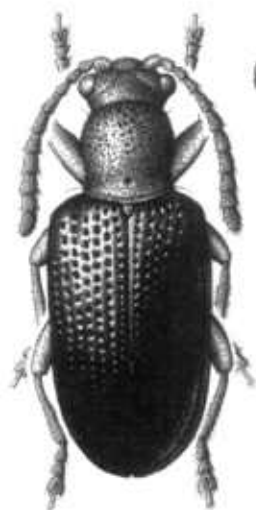


35



a

36. *Oulema minuta*. 37. *Oulema collaris*. 38. *Oulema melanopus*.
39. *Oulema maculicollis*. 40. *Oulema cornuta*.



36



37



38



39

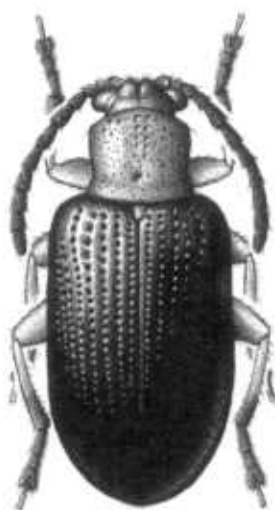


40

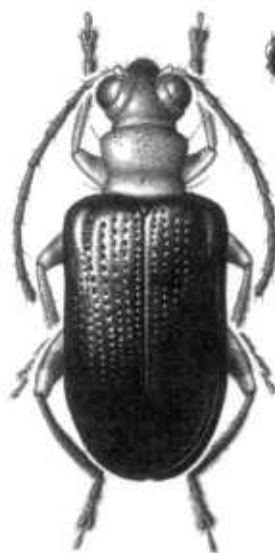
41. *Oulema laticollis*. 42. *Oulema texana*. 43. *Oulema*
melanoventris. 44. *Oulema palustris*. 45. *Oulema brunnicolis*.



41



42



43



a



44



a



45



a



b

Figures 46–49. View of tarsal claws:

46, *Lilioceris lili*; 47, *Crioceris duodecimpunctata*; 48, *Oulema melanopus*; 49, *Lema trilinea*.

Figures 50–57. Head views:

50, *Lilioceris lili*; 51, *Lema trilinea*; 52, *Neolema sexpunctata*;
53, *Lema jacobina*; 54–55, *Oulema melanopus*;
56–57, *Oulema simulans*.



46



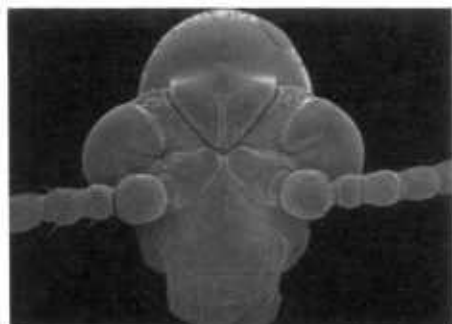
47



48



49



50



51



52



53



54



55



56



57

Figures 58–65. Head views:

58–59, *Oulema brunnicollis*; 60–61, *Oulema cornuta*;
62–63, *Oulema palustris*; 64–65, *Oulema texana*.

Figure 66. Body view of *Oulema sayi*.

Figures 67–69. Pronotal views: 67, *Oulema margineimpressa*;
68, *Oulema maculicollis*; 69, *Oulema sayi*.



58



59



60



61



62



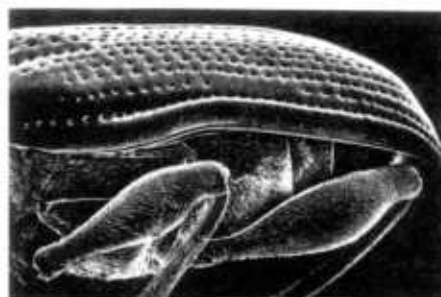
63



64



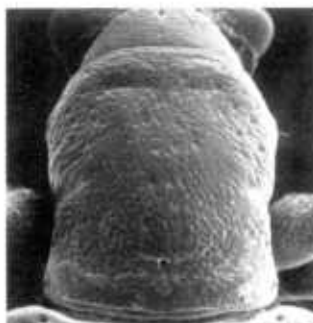
65



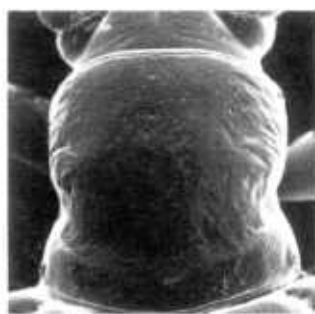
66



67



68



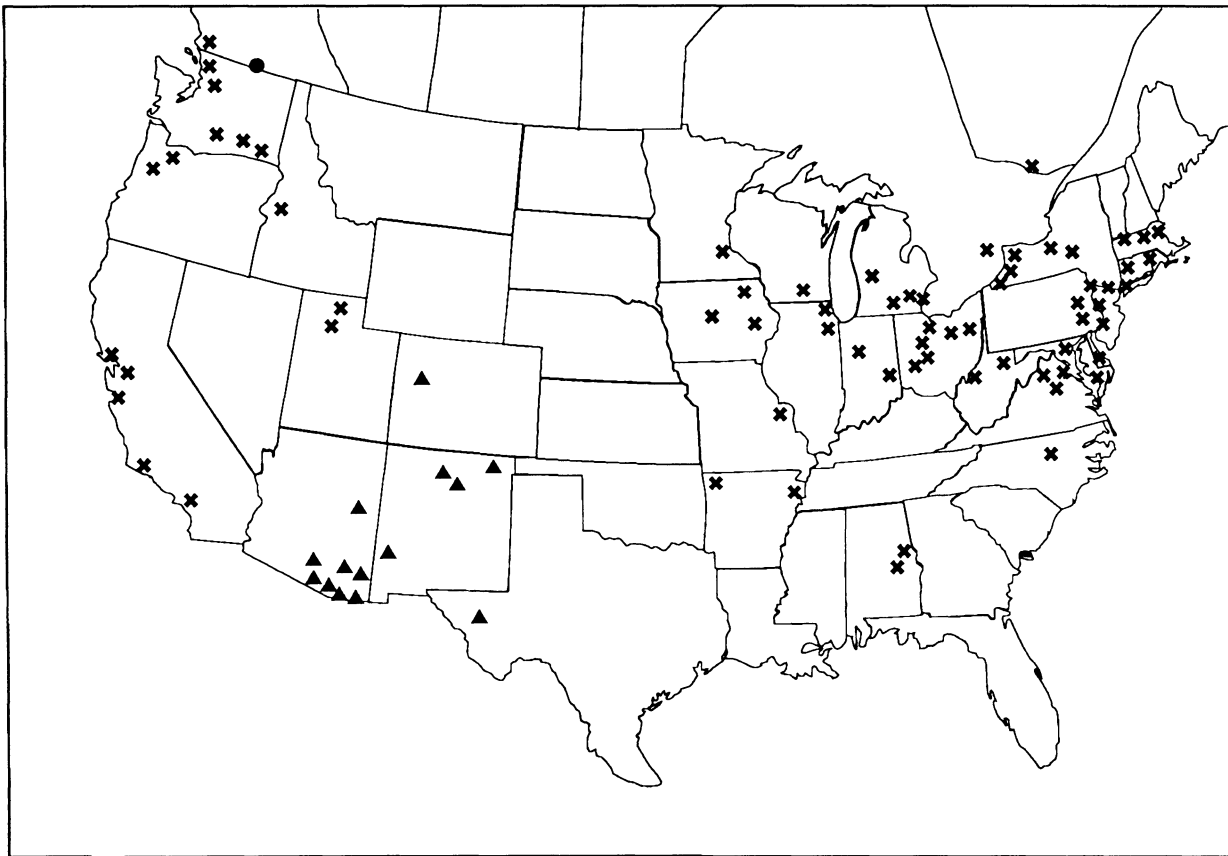
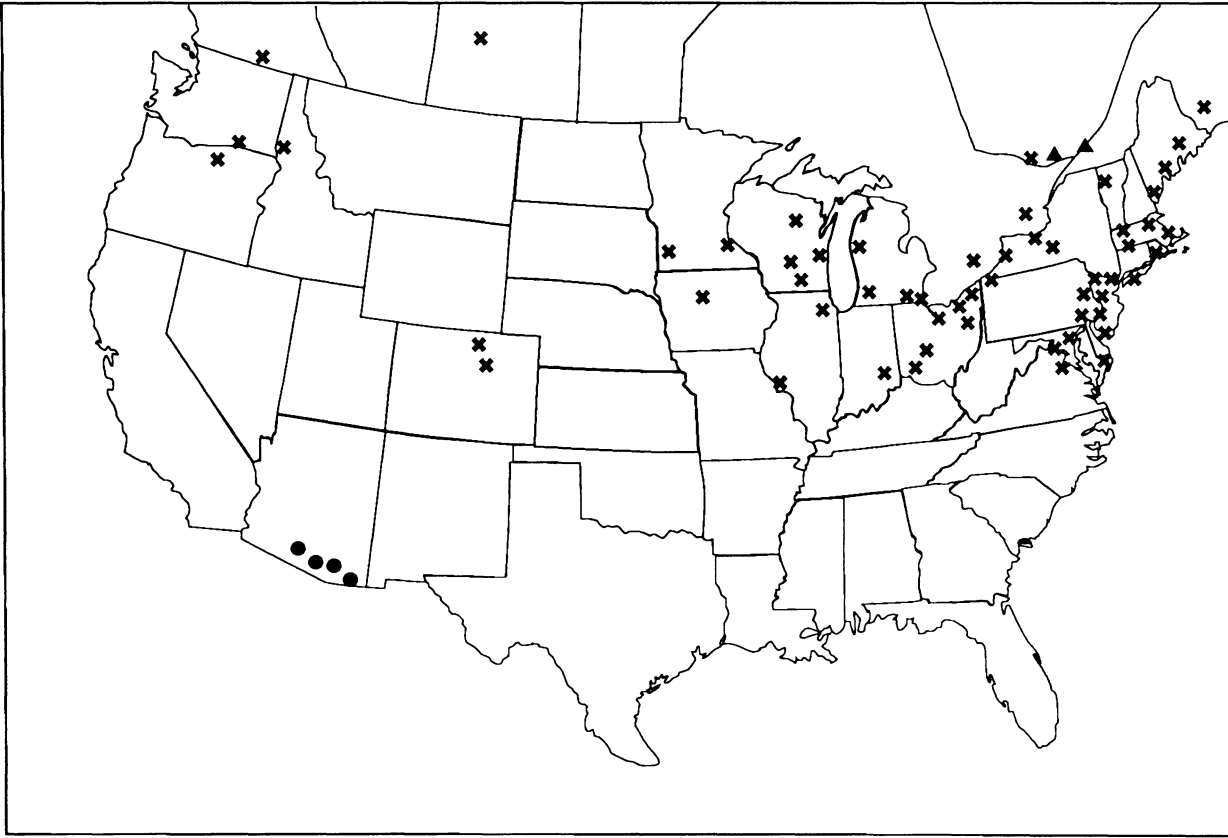
69

70

- ▲ *Lilioceris lili*
- *Oulema margineimpressa*
- ✕ *Crioceris duodecimpunctata*

71

- *Neolema adunata*
 - ▲ *Lema nigrovittata*
 - ✕ *Crioceris asparagi*
-

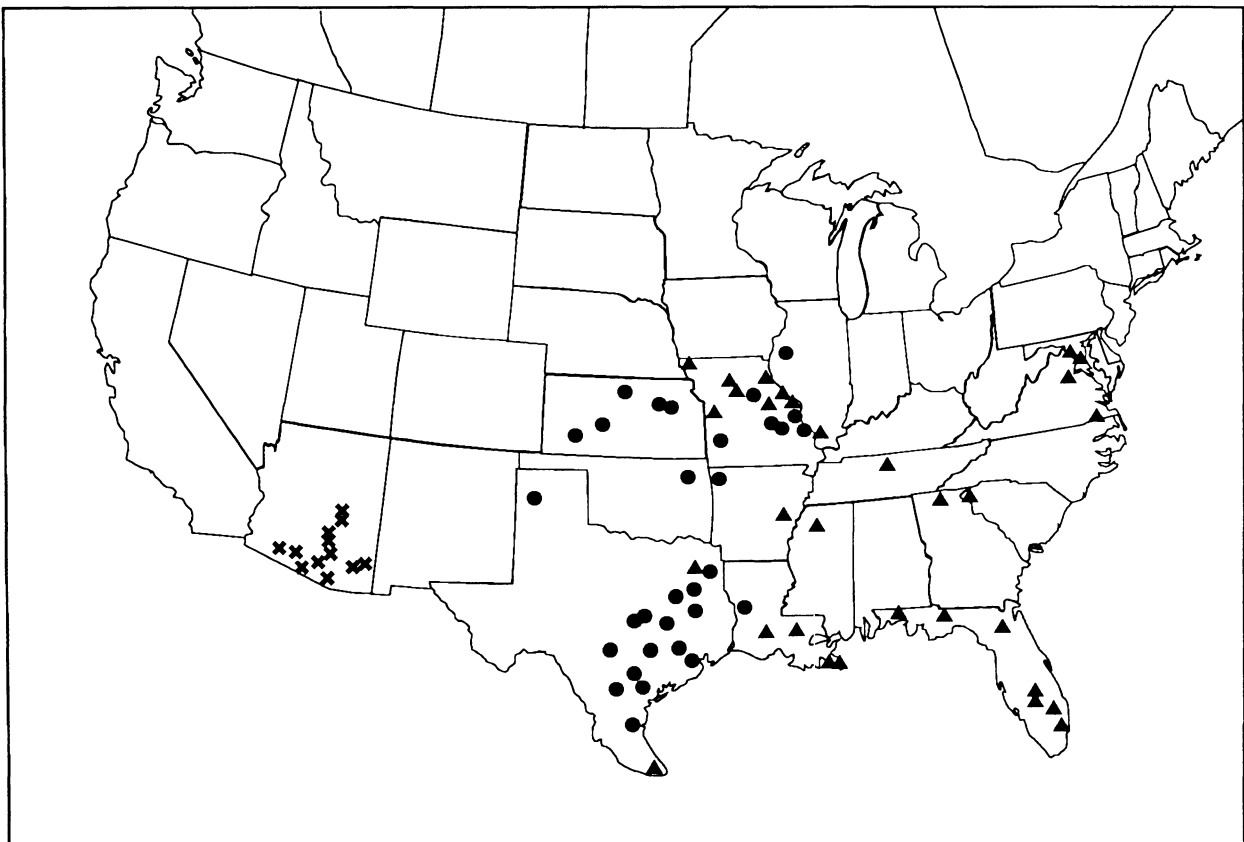
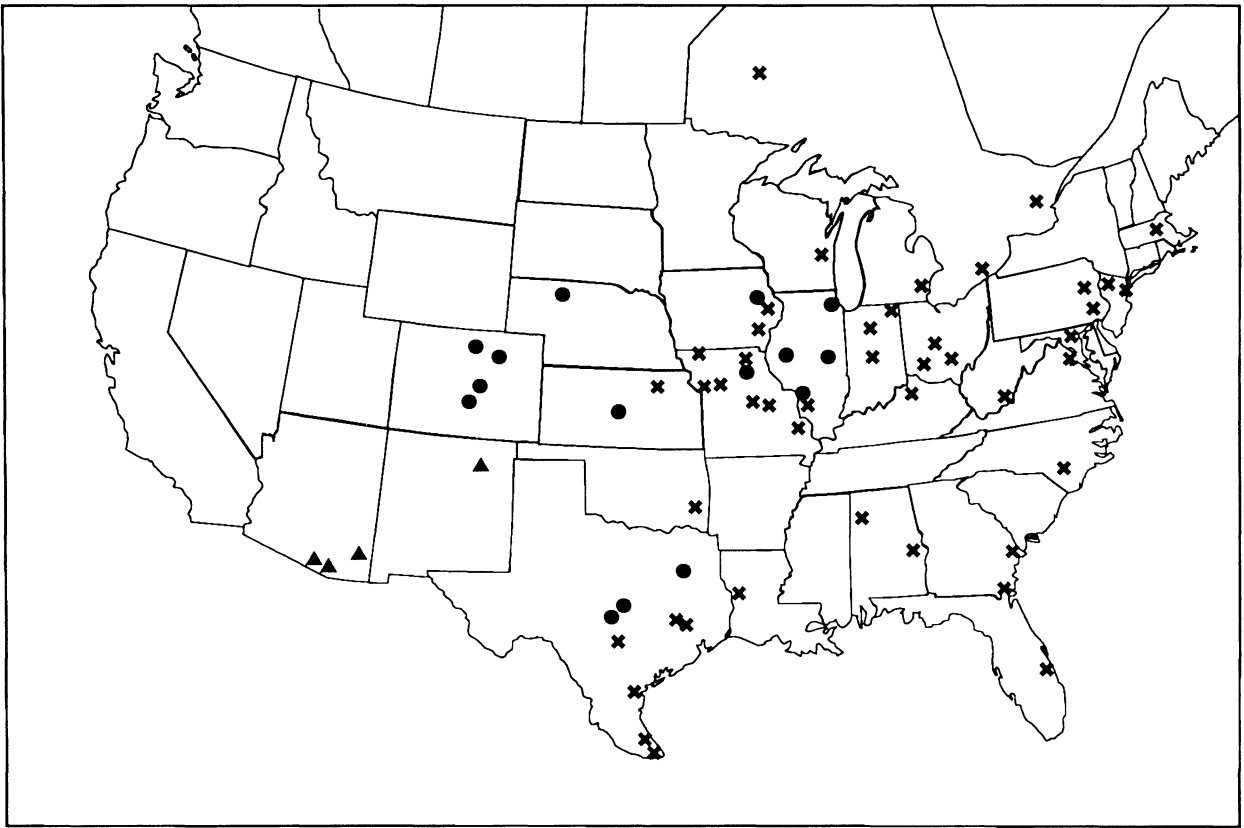


72

- ▲ *Oulema concolor*
- ✕ *Oulema palustris*
- *Oulema longipennis*

73

- ▲ *Neolema cordata*
 - ✕ *Lema balteata*
 - *Oulema simulans*
-

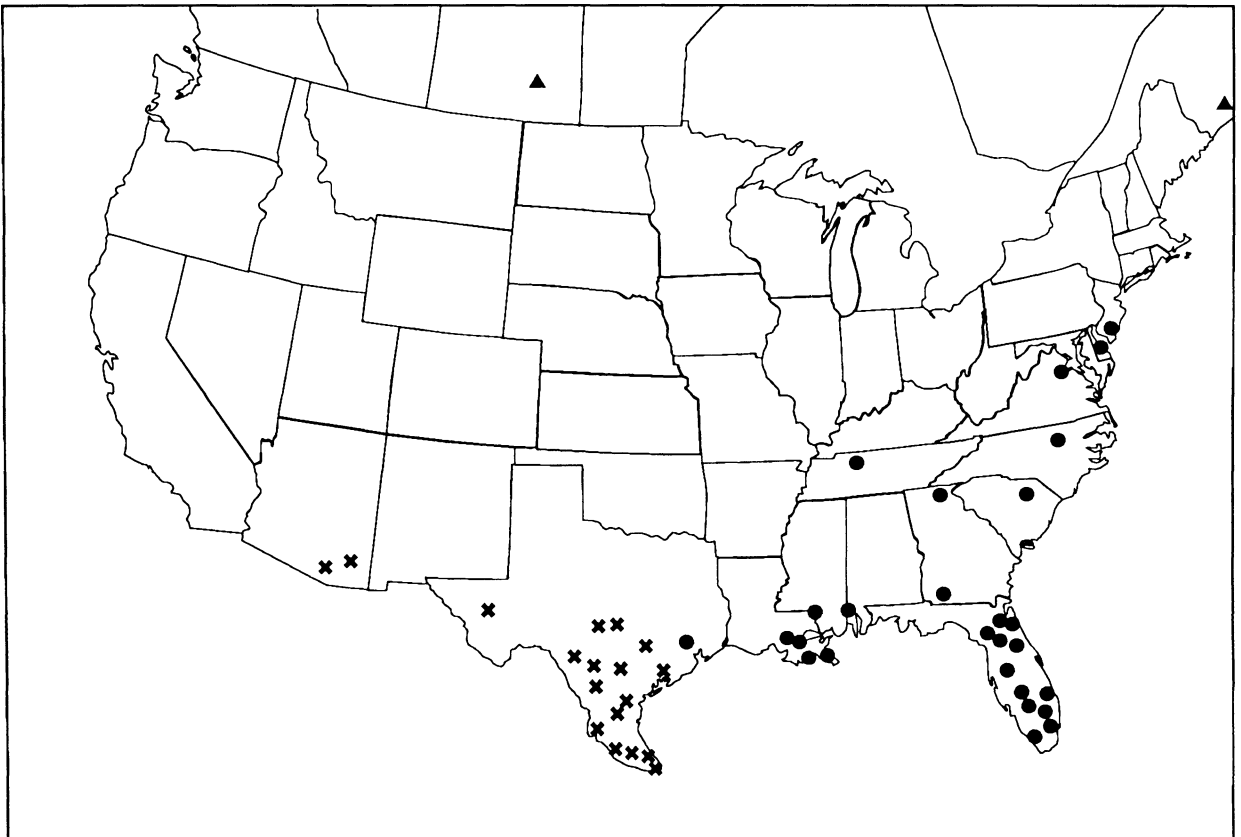


74

- ✕ *Neolema ovalis*
- ▲ *Neolema gundlachiana*
- *Oulema melanoventris*

75

- *Lema solani*
 - ▲ *Lema puncticollis*
 - ✕ *Oulema variabilis*
-

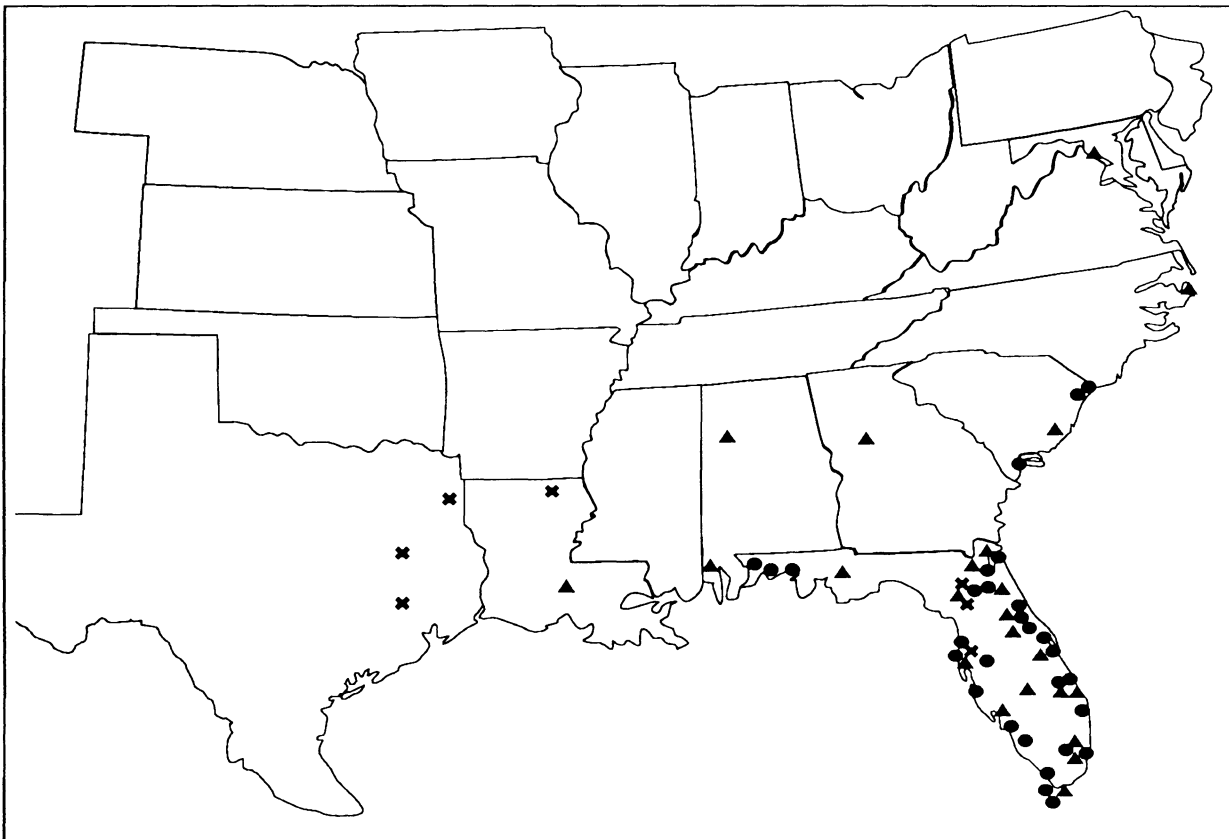
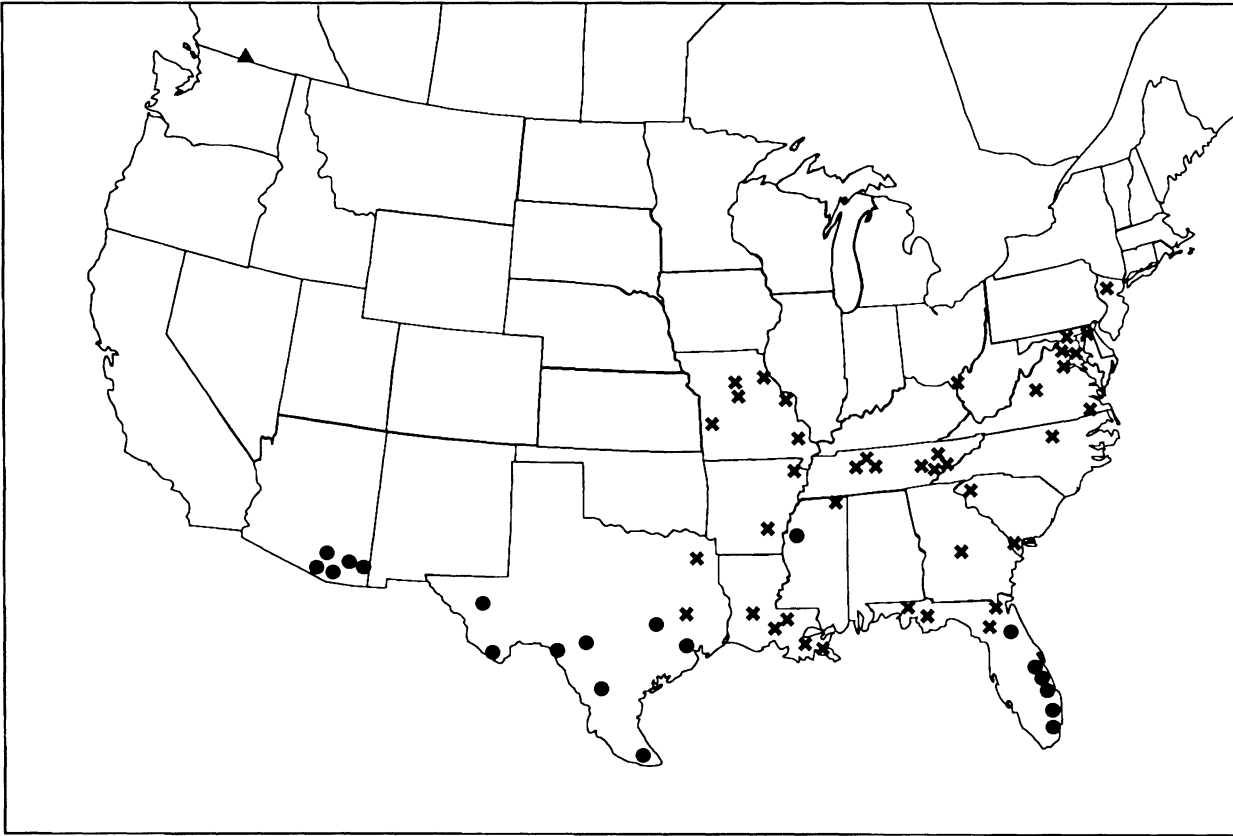


76

- ✕ *Oulema sayi*
- *Lema trabeata*
- ▲ *Oulema coalescens*

77

- *Lema t. medionota*
 - ✕ *Lema conjuncta*
 - ▲ *Oulema cornuta*
-

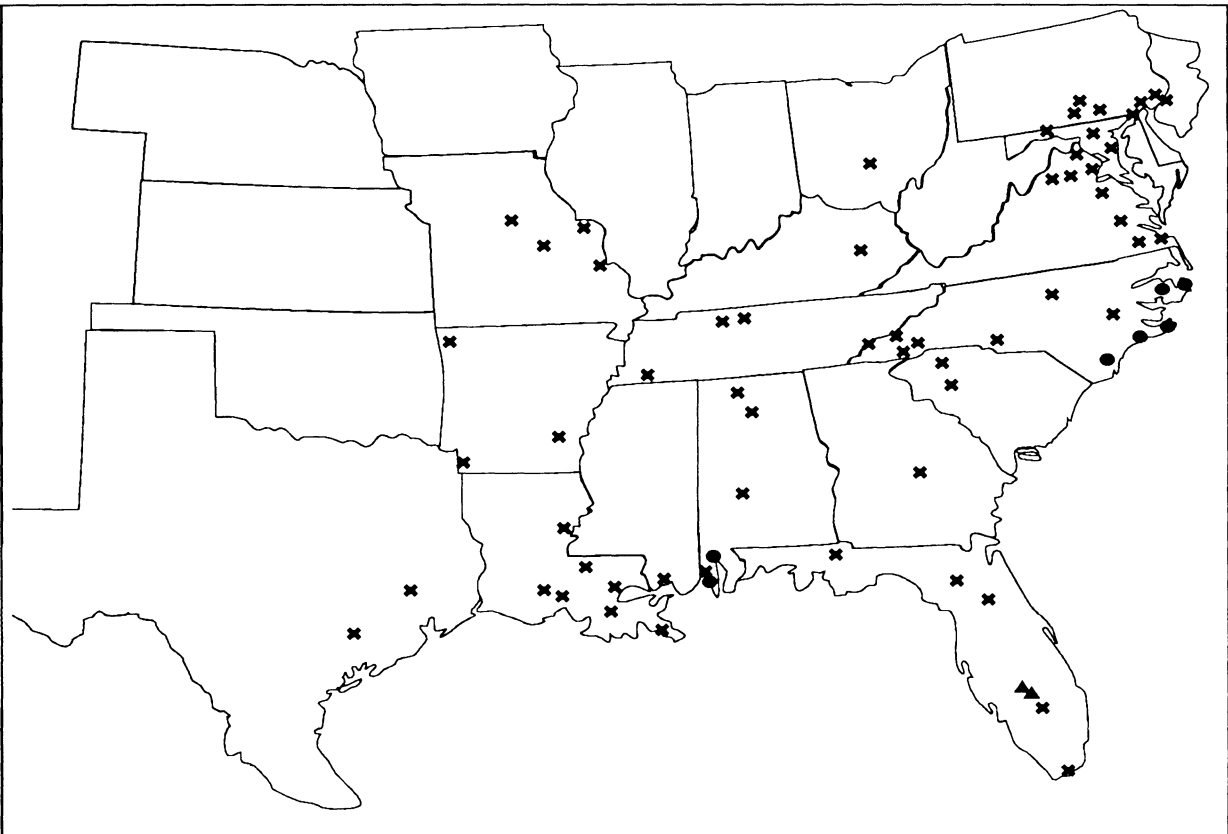
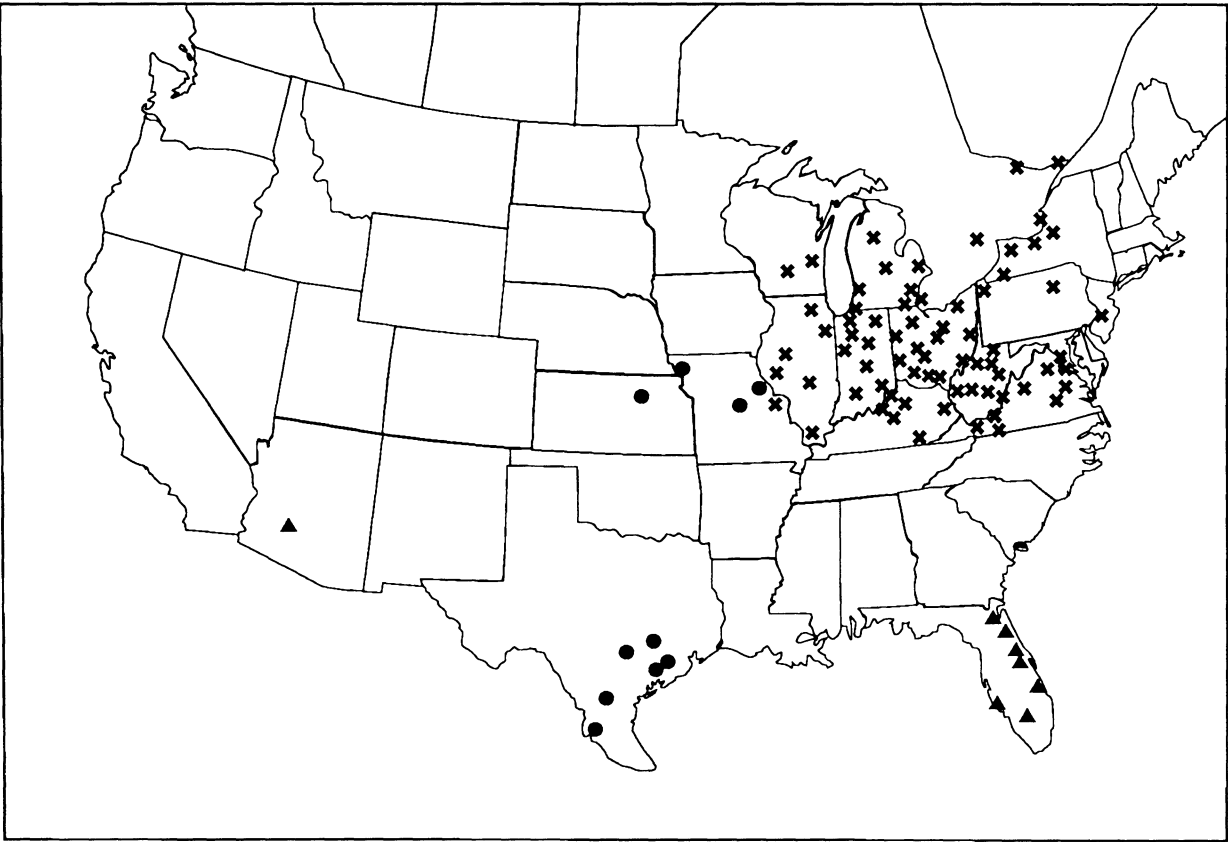


78

- *Neolema jacobina*
- ✕ *Oulema melanopus*
- ▲ *Lema circumvittata*

79

- *Neolema sexpunctata*
 - ✕ *Lema melanofrons*
 - ▲ *Oulema laticollis*
-

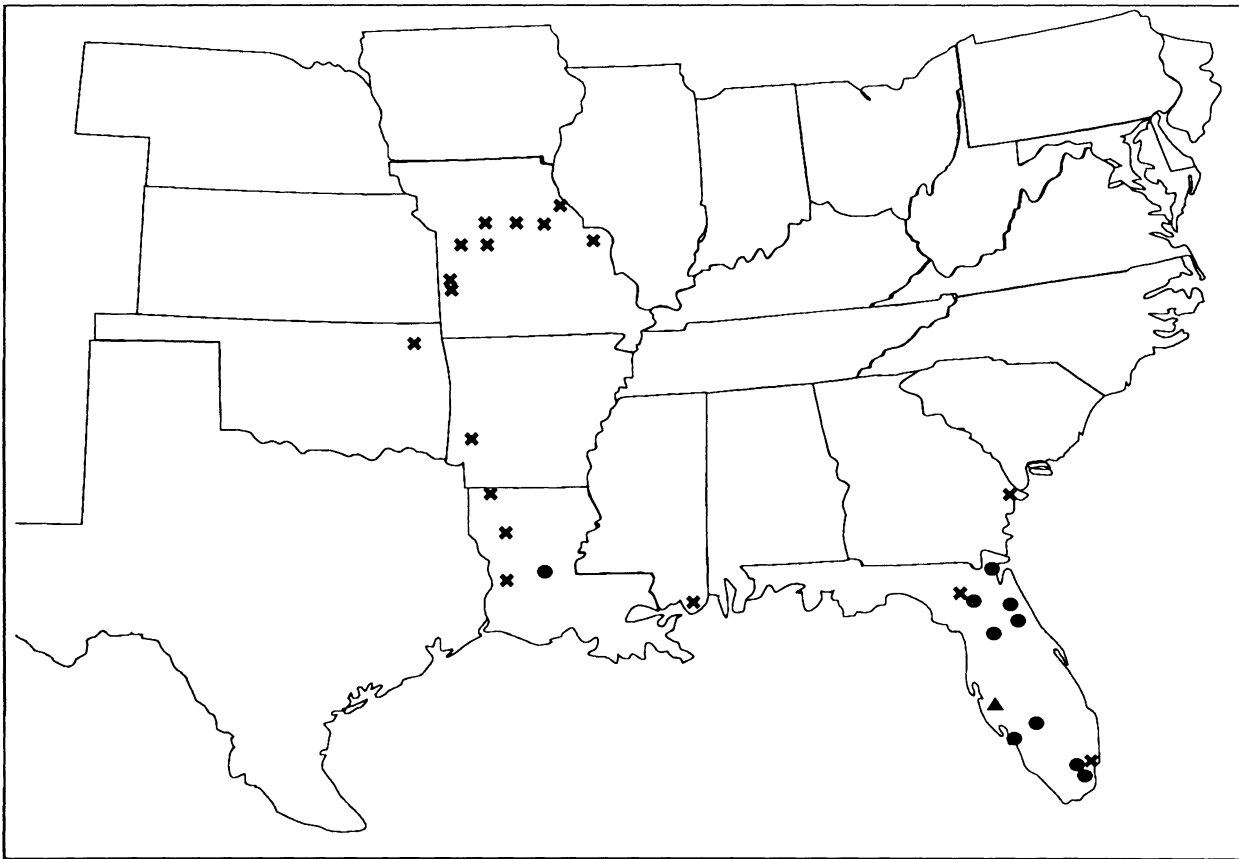
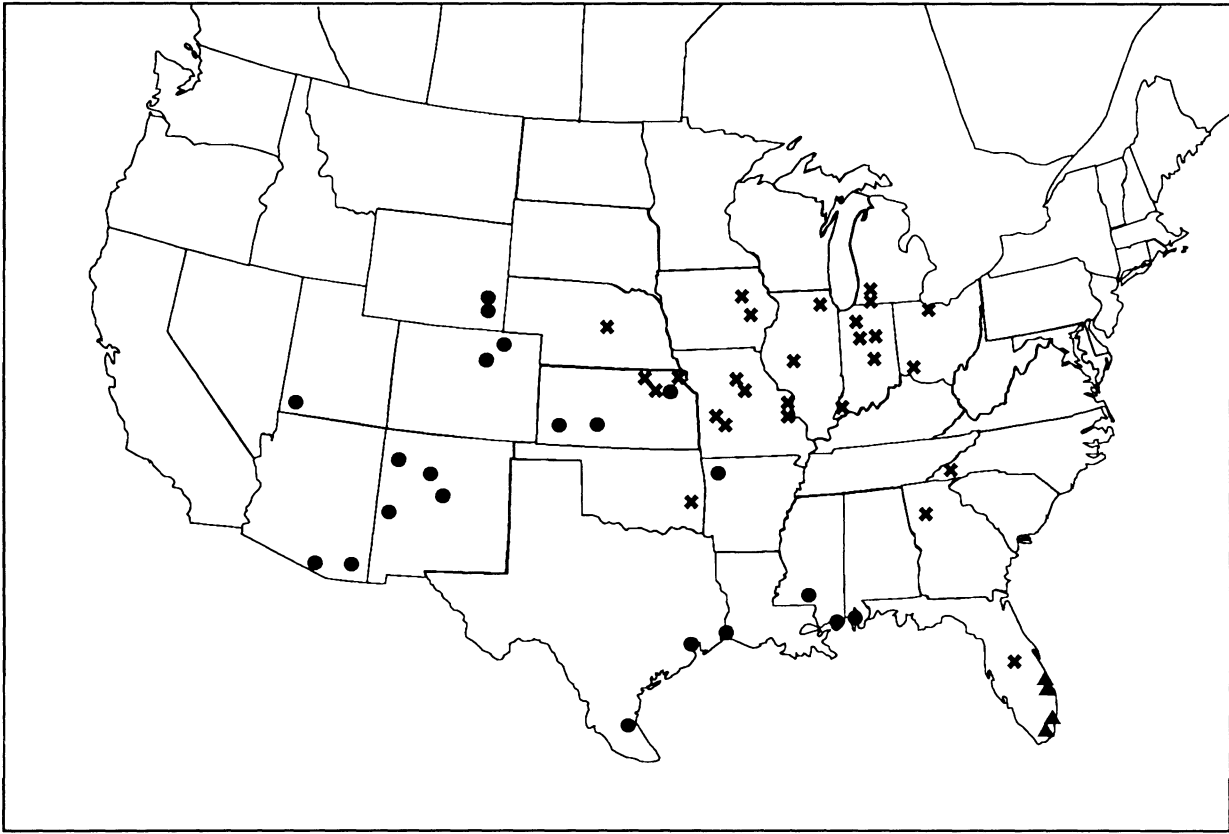


80

- ▲ *Lema confusa*
- *Lema pubipes*
- ✕ *Oulema collaris*

81

- ▲ *Oulema minuta*
 - *Neolema ephippium*
 - ✕ *Oulema maculicollis*
-

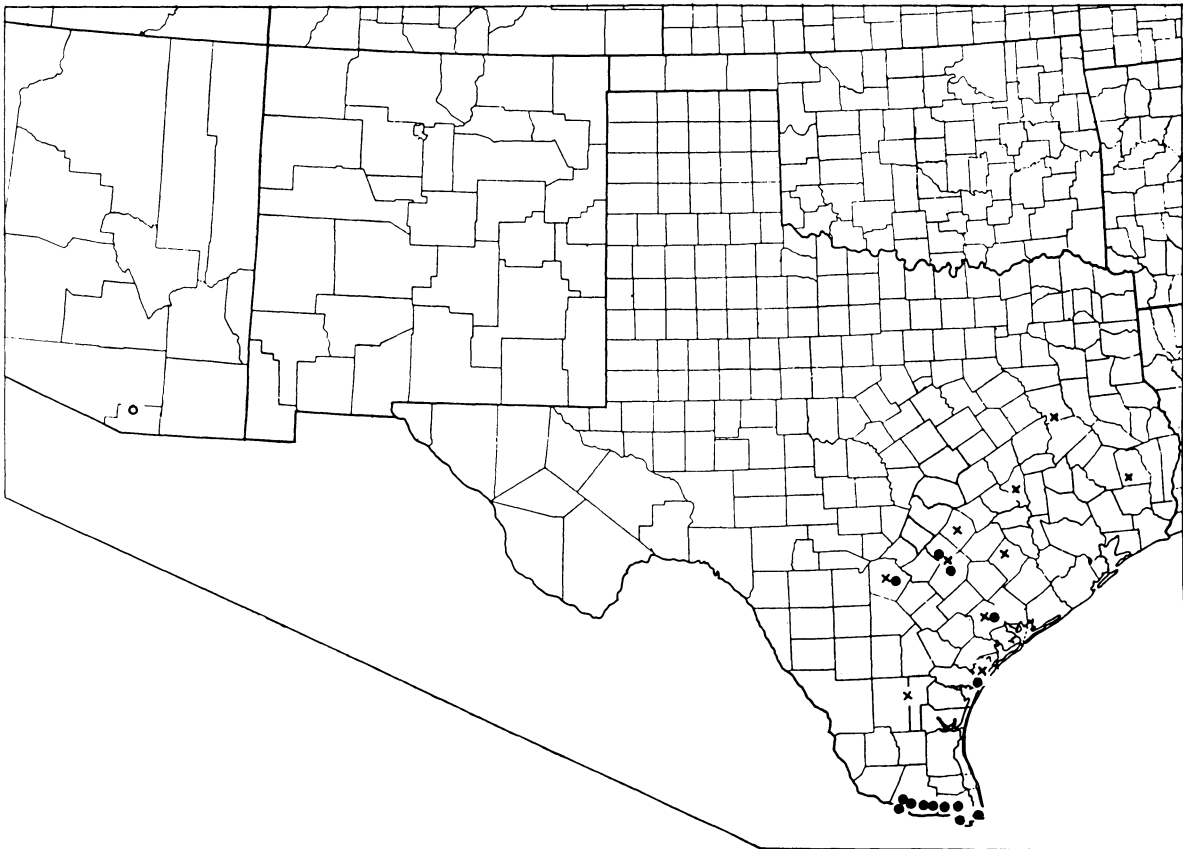


82

- ✕ *Oulema texana*
- *Oulema elongata*
- ▲ *Oulema arizonae*

83

- *Lema opulenta*
 - *Lema maderensis*
 - ✕ *Neolema quadriguttata*
-



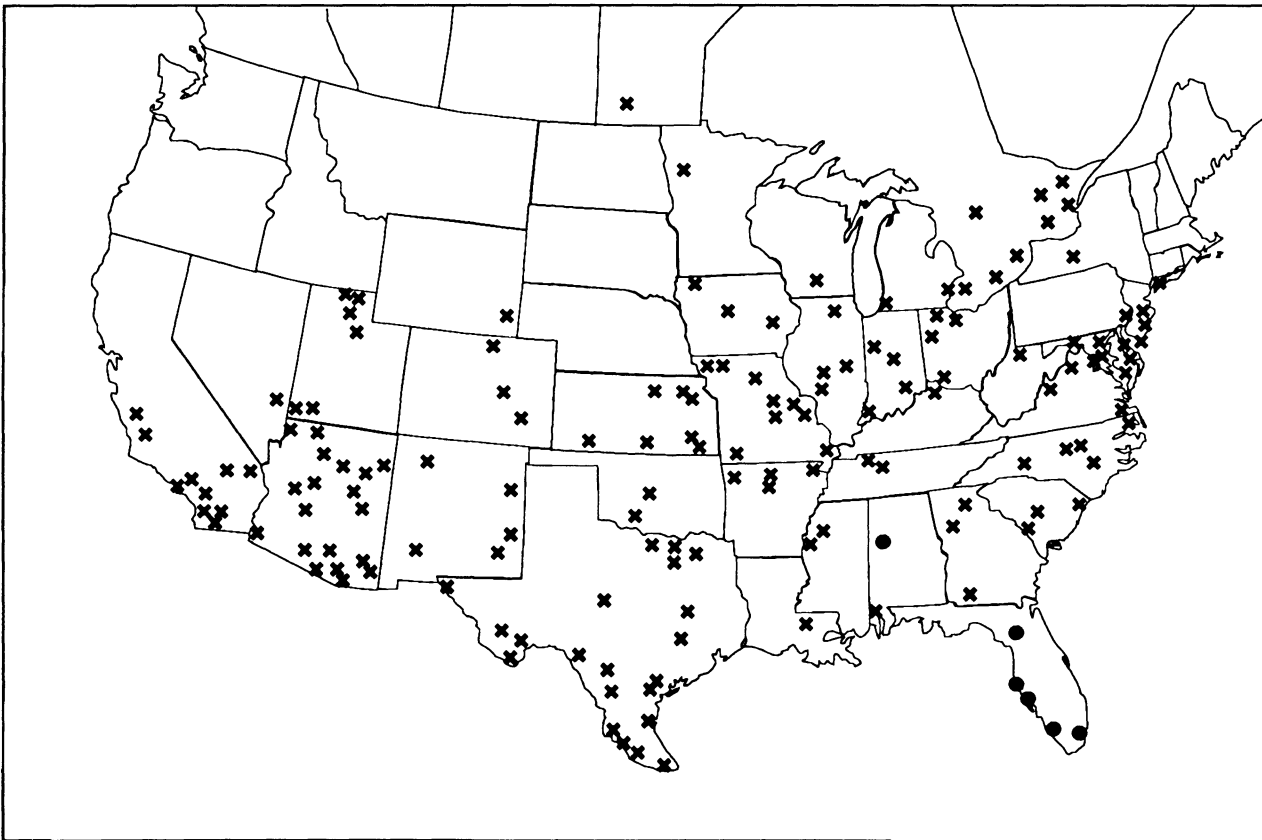
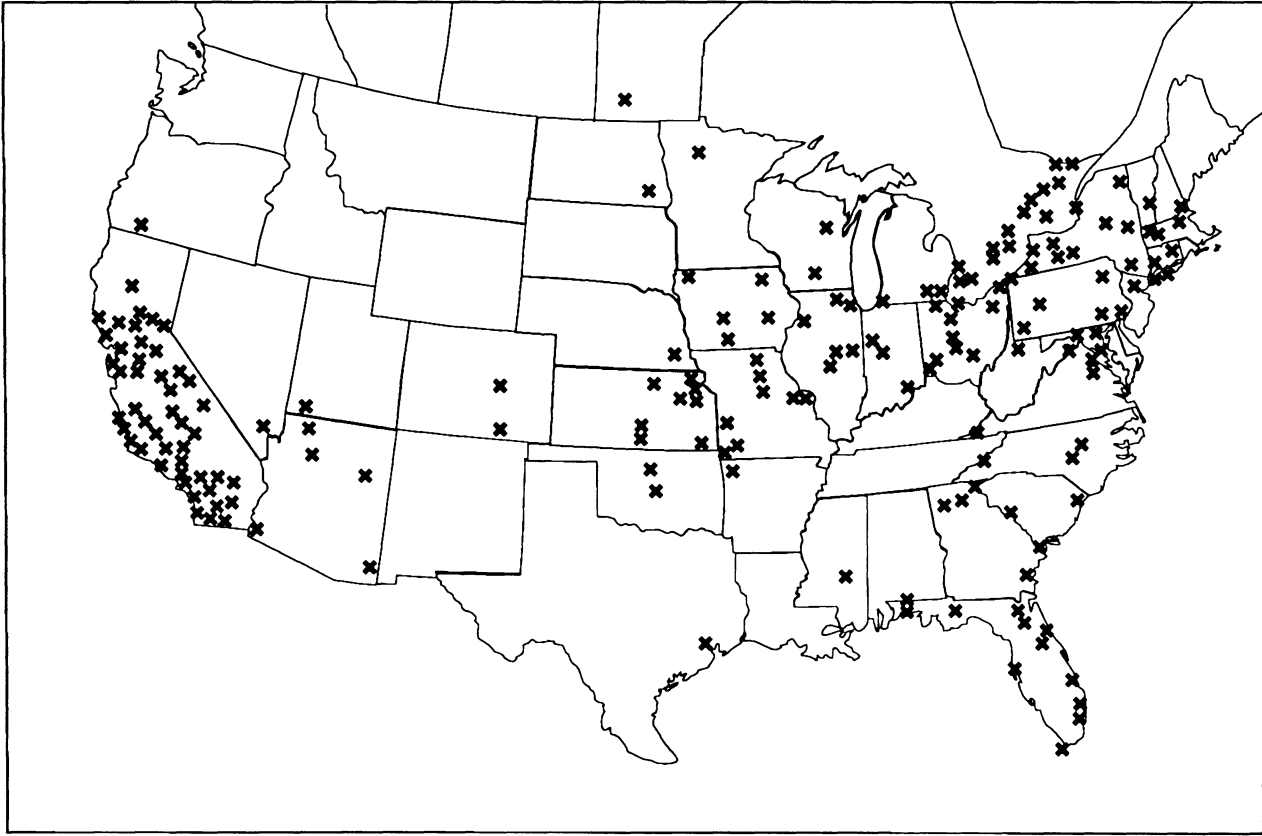
84

✕ *Lema trilinea*

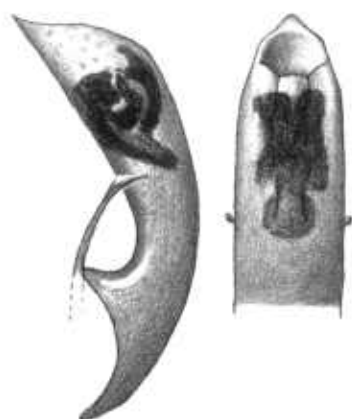
85

✕ *Lema t. trivittata*

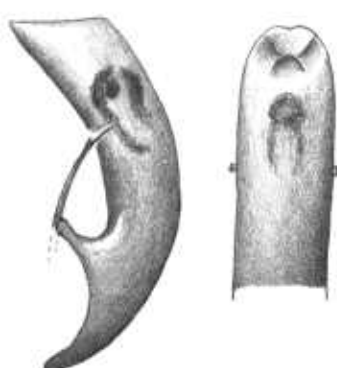
● *Oulema brunnicollis*



Figures 86–94. Aedeagi, lateral and dorsal views:
86, *Lilioceris lili*; 87, *Crioceris asparagi*; 88, *Crioceris*
duodecimpunctata; 89, *Lema balteata*; 90, *Lema circumwittata*;
91, *Lema confusa*; 92, *Lema conjuncta*; 93, *Lema puncticollis*;
94, *Lema melanofrons*.



86



87



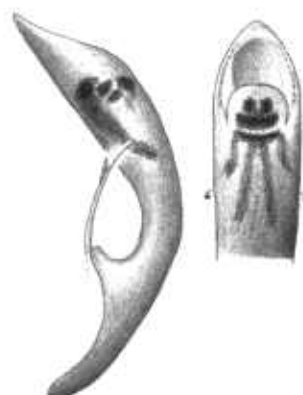
88



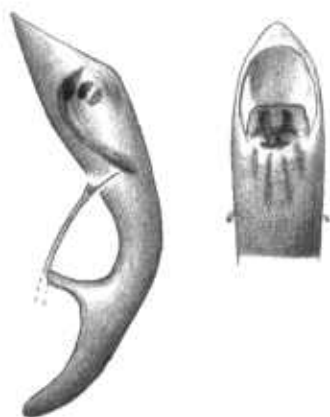
89



90



91



92



93



94

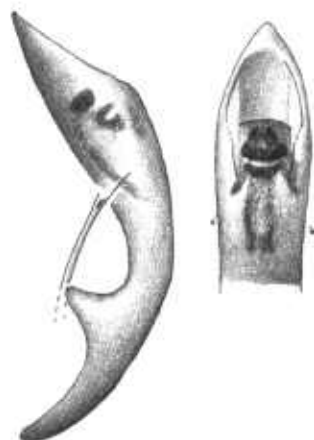
Figures 95–103. Aedeagi, lateral and dorsal views:
95, *Lema nigrovittata*; 96, *Lema opulenta*; 97, *Lema pubipes*;
98, *Lema solani*; 99, *Lema trabeata*; 100, *Lema trilinea*;
101, *Lema t. trivittata*; 102, *Neolema cordata*;
103, *Neolema jacobina*.



95



96



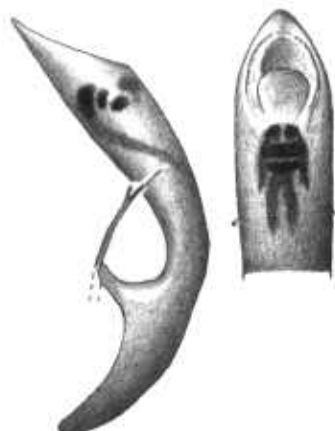
97



98



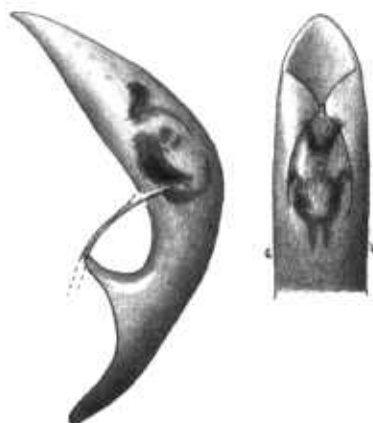
99



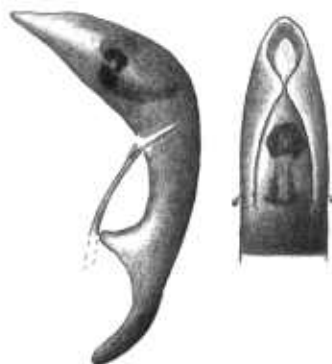
100



101

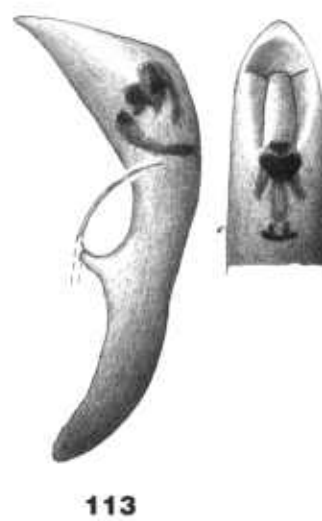
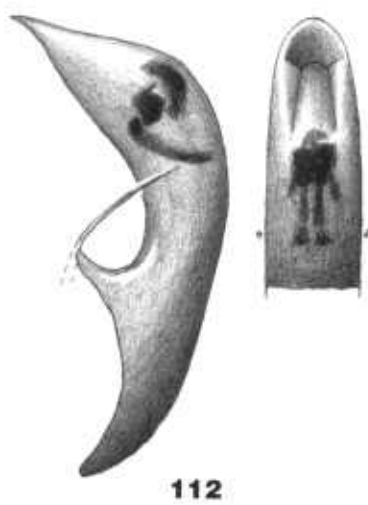
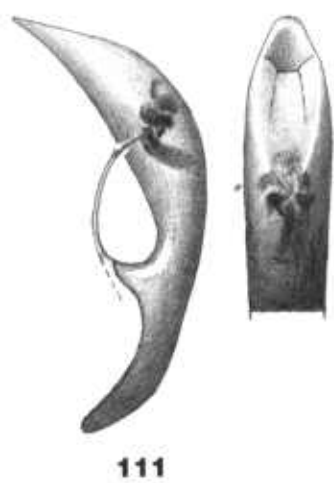
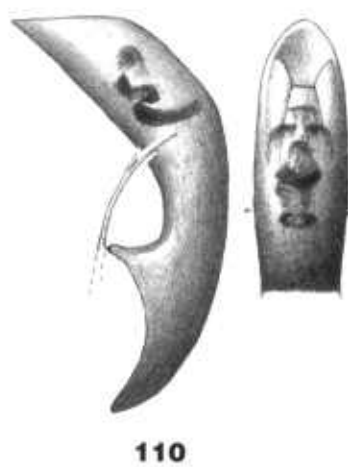
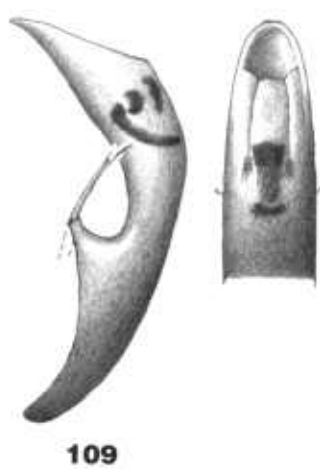
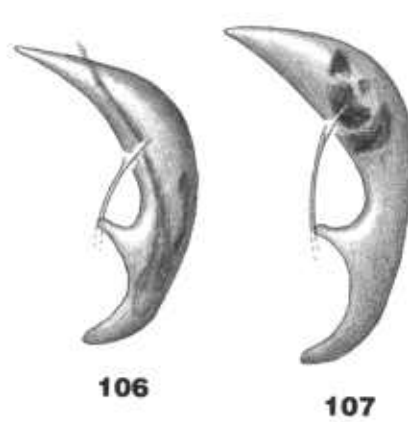


102



103

Figures 104–113. Aedeagi, lateral and dorsal views:
104, *Neolema ovalis*; 105, *Neolema sexpunctata*; 106, *Neolema*
adunata; 107, *Neolema ephippium*; 108, *Oulema arizonae*;
109, *Oulema collaris*; 110, *Oulema concolor*; 111, *Oulema cornuta*;
112, *Oulema elongata*; 113, *Oulema laticollis*.



Figures 114–123. Aedeagi, lateral and dorsal views:
114, *Oulema longipennis*; 115, *Oulema maculicollis*; 116, *Oulema*
marginempressa; 117, *Oulema melanopus*; 118, *Oulema palustris*;
119, *Oulema sayi*; 120, *Oulema simulans*; 121, *Oulema texana*;
122, *Oulema brunnicollis*; 123, *Oulema variabilis*.

